

# Draft Remedial Investigation Report

## Technical Review Comments Newtown Creek

### Remedial Investigation/Feasibility Study

#### Dated November 2016

## Executive Summary

### General Comments

1. The Executive Summary should be revised to reflect and be consistent with the general and specific comments provided for Sections 1 through 9 of the Remedial Investigation (RI) Report.
2. Any conclusions drawn from the Newtown Creek Group's (NCG's) interpretation of the hydrodynamic and sediment transport models developed for the Newtown Creek site will be revisited following U.S. Environmental Protection Agency's (USEPA's) review of these draft model codes and their inputs, interactions, and outputs.
3. A revised draft RI report should be submitted incorporating these comments, as appropriate. However, because of potential feedback to the RI Report from models that are currently under review (hydrodynamic, sediment transport, and point source models) and models that have yet to be submitted to USEPA for review (chemical fate and transport and bioaccumulation models), USEPA will not approve the revised draft RI Report until such time as all the models have been submitted, reviewed and revised, as necessary, to determine if modifications to portions of the RI Report are required. Further, while not anticipated, the FS sampling work that is to be conducted may also affect some conclusions in the RI Report. It is not unusual to review the draft RI and FS reports on an iterative and concurrent basis, and it is acceptable, and often advisable, for both reports to be finalized in the same general timeframe. A final RI Report is not needed in order to prepare the draft FS Report.
4. The Nature and Extent of Contamination Section of the Executive Summary only discusses sediment, surface water, and sources (East River and point sources). A presentation of groundwater analytical data and associated discussion of these data, similar to the level of detail presented for sediment and surface water, should be added to the Executive Summary. Furthermore, the impacts of groundwater contamination should be discussed in more detail throughout the entire Executive Summary.
5. The executive summary contains no reference to total petroleum hydrocarbons (TPH) in the in the sediment. High TPH (> 10,000 mg/kg) is found in the majority of Newtown Creek above CM 2.2, including Dutch Kills. The pervasive observation of sheens within the

sediment column also indicates the presence of free-phase hydrocarbons and should be discussed.

### **Specific Comments**

1. Page ES-1, Site Setting and Physical Characteristics. This section should include the New York State surface water classification and the definition of that specific classification. Newtown Creek is classified by NYS as an SD waterbody. “The best usage of Class SD waters is fishing. These waters shall be suitable for fish, shellfish and wildlife survival. In addition, the water quality shall be suitable for primary and secondary contact recreation, although other factors may limit the use for these purposes. This classification may be given to those waters that, because of natural or man-made conditions, cannot meet the requirements for fish propagation.”
2. Page ES-2, Site Setting and Physical Characteristics, first paragraph, second sentence. The meaning of this sentence is unclear though the history of industrial and municipal discharges is well documented. Revise the sentence as follows: “Industry has used Newtown Creek extensively as a receiving waterbody for both stormwater and wastewater discharges in parallel with municipal development and sewer discharge.”
3. Page ES-2, Section Site Setting and Physical Characteristics, second paragraph, second sentence. The text reads as follows: “The East River has a dominant effect on the first 2 miles of the creek through twice-daily tidal exchange that moves suspended solids in and out of Newtown Creek, resulting in deposition, resuspension, and mixing of particles in surface sediment.” As an example of General Comment 2 above, the upstream extent of the East River’s influence on Newtown Creek will be evaluated following USEPA’s review of the draft models.
4. Page ES-3, Section Site Setting and Physical Characteristics, last paragraph:
  - a. Last sentence. The text reads as follows: “Several lines of evidence demonstrate the net depositional nature of the Study Area, with net deposition rates ranging from less than 1 to as much as 7 centimeters per year (cm/year).” Provide clarifying text on the existence of localized areas of erosion, if they exist, and the spatial extent over which the deposition rates were calculated.
  - b. Last paragraph. Describe the lines of evidence used to develop sedimentation rates, the data quality of each sedimentation rate line of evidence, the range of sedimentation rates provided by each line of evidence per site area, and how the individual lines of evidence were combined to arrive at the 1 to 7 cm/year deposition rate
5. Page ES-4, Section Site Setting and Physical Characteristics, first paragraph. The authors state that the sediment bed is accreting; further information should be provided to reconcile this statement with the fact that the depth of the navigation channel has not changed over time.
6. Page ES-6 and graphics on page ES-7, Section Sediment, first paragraph. The graphics compare surface sediment concentrations with the 95/95 Upper Tolerance Limit (UTL) for

surface sediment data from 14 reference areas. A more robust and comprehensive comparison of Study Area data against reference/background area data is needed in the main RI Report. See general comment No. 2 in the comments on Section 4.

7. Page ES-9, Surface Water. This section states that there are important, ongoing sources of contaminants of potential concern (COPCs) to Newtown Creek evidenced by the increased COPC concentrations during wet weather sampling events. It is not clear that the variation between wet and dry weather data truly is significant due to the large variability in wet-weather COPC concentrations and because the chemical fate and transport model has not been completed. The more appropriate conclusion is that Newtown Creek is impacted by urban run-off and CSO discharges that affect various reaches of the site. Also, since there is very limited wet-weather data for the East River, it remains unclear if wet-weather COPC concentrations in Newtown Creek are specific to Newtown Creek or represent a harbor-wide, urban condition. The text should address these considerations.
8. Page ES-12, Sources, last bullet. This bullet should convey to the reader the significance of COPC contribution to Newtown Creek via porewater as was done in previous bullets. It is currently phrased to minimize the quantity of dissolved COPCs being transported through the sediment bed and into surface water.
9. Page ES-13, Sources, first full paragraph. The conclusion that point sources which are not “fully controlled will limit the effectiveness of remedial actions in reducing risk” is premature and not necessarily correct. Biological data from reference areas with CSO point source discharges indicate risk from CERCLA COPCs as evaluated from these data could be significantly decreased to background (reference area) levels even with continuing CSO discharge during storm events.
10. Page ES-13, Fate and Transport, first full paragraph, second sentence. Delete the following portion of second sentence: “...therefore, the locations of impacts observed today cannot necessarily be directly linked to proximate upland sites.”
11. Page ES-13, Fate and Transport, second to last paragraph. The discussion regarding “fine particles being transported downstream” requires further explanation since the term “downstream” has little relevance in this system. It is unclear which parts of the study area (or areas outside the mouth of the creek?) the authors consider to be “downstream” repositories for these contaminated fine particles.
12. Page ES-13, Fate and Transport, last paragraph. This paragraph describes the process of less contaminated sediment depositing over more highly impacted sediment and subsequent mixing/dilution process that is occurring results in a decline in concentrations over time. This statement conflicts with previous statements that ongoing point source discharges “will limit the effectiveness of remedial actions” and causes confusion to the reader. Explain this inconsistency and clarify the text.
13. Page ES-14, Fate and Transport, last paragraph. It is not clear that the data support that the contaminated groundwater inputs are “a small fraction of the contaminant mass present in the subsurface sediment.” Further support should be provided.

14. Page ES-17, Risk and Exposure, second bullet. If COPCs in porewater are not the cause of the toxicity observed in specified sediment locations, then other possible reasons for the observed toxicity including, but not limited to, bulk sediment comparisons, concentrations of individual compounds, and non-aqueous phase liquid (NAPL) should be evaluated and discussed.
15. Page ES-18, Section Conceptual Site Model and Conclusions, first paragraph, third sentence. The text states "...the risks to the ecological communities at many locations in the tributaries are attributed primarily to significant ongoing discharges from CSOs and MS4s." This sentence should be deleted or the basis for the assertion should be provided. Risks from CSO and MS4 discharges have not been assessed.
16. Page ES-15, Fate and Transport
  - c. Continuing paragraph. A statement is made that groundwater estimated contaminant loads are attenuated as groundwater travels through the sediment bed and seeps into the surface water column. Figures 4-143, 148, & 153 appear to contradict this statement. Of the three COPCs that are presented, COPC concentrations in groundwater do not consistently attenuate and often COPC concentrations are higher in porewater seeping into surface water than concentrations in groundwater collected from the native materials (sand or clay) below the soft sediments. This conclusion seems to conflict with the applicable data. This conflict needs to be discussed in more detail, here and elsewhere in the report where this topic is presented and discussed.
  - d. Second Full Paragraph. The statement is made that residual NAPL is not mobile. This is contradicted by observations of multiple regulatory agencies during ebullition surveys that show gas generated in the sediment bed by microbial activity mobilizes free-phase hydrocarbons in several areas of Newtown Creek resulting in sheens on the water surface. It is also likely that as observed sheens decay and sink to the creek bed, they are transported along the surface of the sediment bed. Revise the text to provide a more complete explanation.
  - e. Third full paragraph, Ebullition – The second field ebullition study should be included and discussed in the RI Report as the results were significantly different than those of the initial field ebullition survey.
17. Page ES17, Risk and Exposure, second bullet. NAPL and/or free-phase hydrocarbons (FPHC), observed during sediment grab samples, should be included to the potential reasons for the toxicity observed in the specified locations if COPCs in porewater are not the cause. COPCs in bulk sediment should not be discounted as a line of evidence.
18. Page ES-18, Risk and Exposure, continuing paragraph. To provide a fuller picture of the fate and transport of COPCs in Newtown Creek, the following language should be included in this paragraph: "...This prevents a straightforward correlation between the TPCB concentrations in tissue samples with surface sediment concentrations in the Study Area alone, however tissue data for several of these species indicate the Study Area has a discernible effect on the concentrations of COPCs in these species."

19. Page ES-20, Tributaries, Second hyphen. To be more complete, the text should be revised as follows: "... due primarily to discharges of solids from CSO and MS4 point sources, releases of NAPL, and industrial discharges.
20. Page ES-18 to ES-21, Conceptual Site Model, first paragraph. This paragraph contradicts earlier sections of the Executive Summary. It states that solids originating from the ongoing point source discharges also contribute COPCs at levels that contribute to ecological and human risk. However, the summary earlier stated that the solids were effectively mixing with more highly contaminated sediments thereby mitigating risk. Revise the text to include an explanation of this apparent contradiction.
21. Page ES-20, Sediment CM 2+, sixth bullet (hyphen). The information presented here is biased and does not reflect significant comments provided on the baseline ecological risk assessment (BERA). Remove references to CSO and MS4. Replace "other contaminants and a complex mixtures of organic compounds related to CSO, MS4..." with "NAPL, FPHC, or confounding factors."
22. Page ES-19, Section Conceptual Site Model and Conclusions, first full sentence. The text states: "Due to the net depositional nature of this reach, surface sediment concentrations are more similar to the East River than concentrations found in CM 2+ and the tributaries." Explain how this conclusion was reached when no surface sediment samples were collected from the East River.

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# Section 1 Introduction

## Specific Comments

1. Page 1, Section 1.1 RI/FS Objectives: Include a more general statement of the overall objectives of the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) Remedial Investigation/ Feasibility Study (RI/FS), which, in general, are to collect sufficient data and information to define the nature and extent of contamination at the site, support characterization of risks to human health and the environment, develop and evaluate effective remedial alternatives in the FS, and support risk management decisions and selection of a remedy. The site-specific goals and objectives described in the rest of Section 1.1 are to support the overall objectives of the RI/FS. The Section should also cite CERCLA and the National Contingency Plan (40 CFR 300), which provide the legal basis and regulatory requirements for the execution of field activities and preparation of RI/FS reports for CERCLA sites.
2. Page 4, Section 1.3, second paragraph: This paragraph states that NYC began operating a combined sewer that “regularly added raw sewage and other pollutants into the creek.” For the site background to be accurate and complete, in addition to releases from municipal sources, the paragraph should be amended to similarly include statements regarding significant releases from industrial sources including by-products, sludge, spills of raw materials, and accidental releases of product into Newtown Creek. .
3. Page 8, Section 4 Description: Nature and Extent of Contamination: Add a statement explaining that, while many contaminants are present in the creek, the RI focuses on as subset of contaminants to help describe, represent and understand the nature and extent of contamination, its fate and transport, and the overall conceptual site model. See comments in Section 4 regarding in-depth evaluation of additional contaminants in the RI Report.
4. Page 8, Section 7 Description: State in the text that the baseline human health risk assessment (BHHRA) and BERA included in the RI Report are draft documents and have not been finalized or approved by USEPA.
5. Page 8, Section 8 Description. Revise the first sentence to be inclusive of all contaminants included in the RI. For example, “...a description of the pathways and processes by which the contaminants, focusing on the subset discussed previously, move throughout the various components....”). See comments in Section 4 regarding in-depth evaluation of additional contaminants in the RI Report.
6. Page 10, Section 1.4 Report Organization, Appendix G – Final Modeling Results Memorandum: State in the text that the hydrodynamic, sediment transport, and the geo-neutral point source models (and sub-models) were submitted as part of the Draft RI Report.

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# Section 2 Program Summary

## **General Comments**

1. Revise the text to note if additional studies were conducted as part of the RI but are not presented in this document (e.g., Section 2.1.7 [Ebullition] does not mention the 2016 field ebullition survey), or if additional follow-on studies are currently planned (e.g., Section 2.1.7 [Ebullition] does not mention the planned 2017 quantitative ebullition sampling).
2. For each medium discussed in Section 2, the sample summary tables and figures should be referenced in the text.
3. Summarize the applicable deviation memos for each applicable section and state in which appendix the deviation memo is located.

## **Specific Comments**

1. Page 13, Section: 2.1, RI Studies, several paragraphs. This section mentions surface water, air, sediment, and tissue sampling conducted as part of the Phase 1 and 2 Investigations (e.g., “Phase 1 field work included multiple physical and ecological surveys, as well as surface water, sediment, and air sampling...” and “The Phase 2 field activities included multiple physical and ecological surveys, as well as surface water, sediment, and tissue sampling...”). However, no mention is made of porewater or groundwater sampling efforts. Revise Section 2.1 to include a discussion of the porewater and groundwater sample collection efforts.
2. Page 17, Section 2.1.3.1 Surface Sediment, second sentence: It is stated that one of the purposes for collecting and analyzing surface sediment samples is to “*characterize the potential for future natural recovery.*” This language should be removed as it is not an explicit purpose of the RI and potentially biases the approach to the upcoming Feasibility Study (FS).
3. Page 19, Section: 2.1.4.1 Surface Water and Water Quality Profiling, first paragraph, last sentence. The text reads as follows: “Sampling was conducted mainly during dry weather periods for Phase 1 reference area and East River programs...” Provide clarification as to why the East River sampling program did not include wet weather sampling.
4. Page 20, Section 2.1.5.1 Caged Bivalves. This paragraph should include the information that one of the cages was removed early and the tissue analyzed due to high mortality.
5. Page 23, Section 2.1.5 Ecological Studies, fourth sentence: The sentence states “(see Section 2.1.5.5)”. The correct referenced section is 2.1.5.6.
6. Section 2.3 Data Quality Issues, General Comment: There are several known data issues which are not addressed with sufficient depth or are wholly not addressed in the RI Report. These include the total organic carbon (TOC) data quality issues including the use of reanalyzed archived sediment TOC samples and the clarification on the use of the TOC data

in the RI report, risk evaluation, and modeling; the difference in the PCB Aroclor versus PCB congener data reported in Phase 1 versus Phase 2; and limitations regarding dry weather dissolved organic carbon (DOC) data.

7. Section 2.3, Tables 2-2a through 2-2f referring to details on meeting DQOs: These tables refer to the Interim Data Reports and Phase 1 and Phase 2 Data Summary Reports. These reports detail the data validation and data quality. However, to facilitate the RI review, the information should be tabulated and summarized to show the data that were qualified as rejected. In addition, include any corrective actions taken, and the impact on the assessments and evaluations presented in the RI Report.
8. Table 2-3, Overall RI Analytical Completeness: This table sums all the data rejected during each RI Phase. Stating that the data quality objectives (DQOs) are met is not sufficient; supporting justification must be provided. Table 2-3 is not complete as it does not show what categories of samples or analytical groups of data were rejected to give a sense of what areas of analytical or sample issues may have impacted the data quality objectives. In addition, although the total results met the completeness goal of 90%, the table does not show the completeness for individual data categories. Provide a table showing the “count results” by analyte group, consistent with the QAPP, to support the conclusion that the completeness goal was met.
9. Page 25, Section 2.3 Summary of Applicable Site Data and Data Quality Objectives:
  - a. Section 2.3; first paragraph, last sentence - The text and associated tables should refer to the established within the approved QAPP, since no RI acceptance criteria were indicated.
  - b. This section does not adequately address data usability as it relates to DQOs for the Newtown Creek RI/FS study.
    - i. A summary of all data review performed needs to be provided in this section. Summary tables similar to those provided in Appendix B Tables B2-3 and B2-4 capturing systematic and sporadic data quality issues need to be provided for all data (Phase 1 and Phase 2) used in the RI report. Details can be referenced back to individual data summary reports or data validation reports.
    - ii. Tables 2-2a through 2-2f should be revised (as needed) to reflect observed data quality issues for all Phase 1 and Phase 2 sampling programs. The two issues below are provided as examples to be reviewed and ultimately reflected on Tables 2-2a through 2-2f:
      - 1) The issues with point source results for TOC and hexavalent chromium (Cr6+) are not identified on Table 2-2c. The table contains “Yes” in the ‘DQO-met’ field – yet a reader unfamiliar with the history of sample analyses at the site would not know that these data did not meet their DQOs. Such information needs to be either captured in this table or referenced back to a systematic data quality issue summary table for point source data.

- 2) The issue with TOC data collected during the Phase 1 sediments investigation is not reflected in Table 2-2b. Include a summary of the source of the TOC data (initial or archived reanalyzed data), how the final TOC data used in the RI were selected and any uncertainties associated with the selected data.

## **Appendix B**

1. Appendix B, Data Usability Assessment – Review of Phase 2 Data Summary Report.
  - a. Data Validation Reports:
    - i. These reports refer to the 2004 National Functional Guidelines (NFGs), yet some actions taken were not fully consistent with the NFG, such as the qualification of results due to matrix spike (MS) outliers. The 1999 and 2004 Organic NFGs state that no qualification of the data is necessary based on MS and matrix spike duplicate (MSD) data alone. Revise the data validation reports to be consistent with the NFG.
    - ii. These reports note that results near the quantitation limits ( $<5x$ ) were treated as exaggerated and non-detects treated as zero to calculate relative percent differences (RPDs). This approach is inconsistent with the QAPP, Worksheets 12 and 15, and with some of the other validation reports and should be corrected within revised reports.
2. Page 7, Section 2.2.3, Precision: Under NFG defer to the USEPA Region's standard operating procedure (SOP) for actions taken regarding field duplicates. The regional SOPs for inorganic data review, e.g., SOP No. HW-3b for the review of Inductively Coupled Plasma-Mass Spectroscopy (ICP-MS) data, list specific actions to be taken when evaluating field duplicates. The regional SOPs for the review of organic analytical data leaves the application of qualifiers based on field duplicates to professional judgement. A discussion of how field duplicate exceedance was treated needs to be included in this section. Further, if the regional SOPs were not followed, an explanation for this deviation(s) must be included in the RI Report.
3. Page 7, Section 2.2.3 Precision, third paragraph:
  - a. Field duplicate summary tables for Phases 1 and 2 need to be provided. These tables must include side-by-side parent and duplicate results, RPD or difference criteria results, and some indication of the results that do not meet DQOs.
  - b. Include a description of or reference to the percent passing criteria for field duplicates, including an example of the calculation formula. Clarify if only calculable pairs of hits and low detects are used to obtain this value or non-detect pairs are also included in the percent passing value.
  - c. Explain how the percentages of results with RPDs within criteria are calculated. Specifically, explain if non-detect result pairs were used in summation of the numerator expression when calculating the percentage.

4. Page 9, Section 2.2.4, Accuracy, Bias and Sensitivity, first bullet: Summary tables for all field blank and trip blank detections from both Phases 1 and 2 must be included.
5. Page 11, Section 2.3.1, Systematic Data Quality Issues, first bullet, second sentence: Expand on the discussion of “combination of interferences” that were cited other than the matrix interference mentioned.
6. Section 2.4, Data Usability and Limitations, all bullet items: Information such as this, from both Phase 1 and Phase 2, needs to be brought forward into RI Section 2.3 and reflected in RI Tables 2-2a through 2-2f.
7. Appendix B - Field quality control (QC) summary tables need to be prepared and included with the report. Appendix B has some discussion regarding field QC; however, tables summarizing field duplicate results, field rinsate blanks, trip blanks, and any other QC samples should be provided within the report.

## Section 3 Environmental Setting

### **General Comments**

1. Any conclusions drawn from the Newtown Creek Group's (NCG's) interpretation of the hydrodynamic and sediment transport models developed for the Newtown Creek site will be revisited following USEPA's review of these draft model codes and their inputs, interaction, and outputs.
2. The historical information provided in Section 3 needs to link to and inform the understanding of contamination in the creek. Some of the information is too detailed, and its relevance to the understanding of contamination in the creek is not clear, while in other cases not enough information is provided. If it is not relevant to understanding the site conceptual model (e.g., sources, pathways, exposure media, and receptors), it should not be included. The discussion should be revised accordingly.
3. Industrial terminology and jargon need to be clearly defined where used (e.g., green bones, lighterage, feedstock, potlines).
4. Historical information should include figures showing the geographic distribution of historical sources, when available. Discussions of historical operations should all be modified to consistently include processes and contaminants associated with the sources.
5. A summary table should be prepared that presents potential sources, waste management units, industrial processes, potential migration pathways, years of operation, and contaminants associated with potential sources.
6. Section 3 makes numerous references to the draft Data Applicability Report (DAR) dated May 29, 2012. An Addendum to the draft DAR, dated April 4, 2015, provided a limited update (series of maps and tables providing additional information). Since the last update of the DAR was in April 2015, Section 3 of the RI Report should include a summary of any significant changes in the status and/or conditions at upland facilities, including respondent properties. Also, the Addendum to the draft DAR should be referenced in the document and included in the Appendix.

### **Specific Comments**

1. Page 26, Section 3 Environmental Setting, first paragraph, last sentence. The text reads as follows: "The interplay of these inputs, tidal exchange, and the use of this system mainly for marine transport determine the conditions in the creek today." Include groundwater seepage as a factor affecting the condition of the creek today. Also, the last sentence should be revised as follows: "The interplay of these inputs, tidal exchange, the use of this system mainly for marine transport, and the historical disposal of industrial and municipal wastes determine the conditions in the creek today."

2. Page 28, Section 3.1.1.2 Hydrogeology: This section should discuss the water bearing properties of the fractured rock. The report discusses utilities dewatering as a possible explanation for negative seepage at CM 0.0 to 0.6; however, it is not clear from the discussion of hydrogeology whether flow from the rock could be responsible for all or part of the utilities dewatering rate.
3. Page 29, Section 3.1.1.2, first full paragraph: In this paragraph, the terms “portion” and “segment” appear to be used interchangeably. The text should be revised such that usage remains consistent, and to clarify “portion” versus “segment”. Since “segment” is used for describing upland contributing areas for the Tier-based calculations, “portion” needs to be defined separately.
4. Page 29, Section 3.1.2 Sediment Bed Characteristics: This section lacks relevant statistical measures of physical properties for both surface and subsurface sediments by area (e.g., individual tributaries, creek mile [CM] CM 0-1, CM 1-2, CM 2+) such as percent fines, percent sands, moisture content, and organic content. Statistical measures presented should include minimum value, median value, arithmetic average, maximum value, and standard deviation. A reference in the text that directs the reader to the appropriate tables in the appendices where additional detailed information can be found should also be included.
5. Page 31, Section 3.1.3.1 Debris, General section comment. Include a figure(s) (with appropriate reference to such figure[s] in the text of this section) showing the results of the side-scan sonar survey.
6. Page 32, Section 3.1.4 Hydrodynamics, first paragraph. The first paragraph references Figure 3-4 which uses a pie chart to present relative contributions of different sources of annual freshwater inputs to Newtown Creek. This paragraph and other portions of this Section may need to be revised based on EPA’s comments on the point source (InfoWorks) and hydrodynamic models.
7. Page 32, Section 3.1.4 Hydrodynamics, first paragraph. The first paragraph references Figure 3-4 which uses a pie chart to present relative contributions of different sources of annual freshwater inputs to Newtown Creek. This paragraph and other portions of this Section may need to be revised based on USEPA’s comments on the point source (InfoWorks) and hydrodynamic models.
8. Page 32, Section 3.1.4 Hydrodynamics, second paragraph, last sentence. The text reads as follows: “Groundwater inflow, where present, does not significantly affect hydrodynamic processes (i.e., circulation, stratification; see Section 4 of Appendix G) based on initial diagnostic testing with the hydrodynamic model.” This statement and any others like it may have to be revised following USEPA’s review of the draft hydrodynamic and sediment transport models (see General Comment 1).
9. Page 33, Section 3.1.5, Water Quality. It would be useful to indicate here the salinity of the East River and whether it is approximately the same as the salinity range provided for the study area.
10. Pages 34 and 35, Section 3.1.6 Sediment Transport, first paragraph.

- a. First sentence. The text reads as follows: “Current understanding of sediment transport within the Study Area is informed by both Phase 1 and Phase 2 data collection, as well as predictions of the sediment transport model (additional discussion of sediment transport is provided in Section 6.3, and detailed documentation of the sediment transport modeling is provided in Section 5 of Appendix G).” USEPA notes that as previously stated in General Comment 1, any conclusions drawn from the sediment transport (and hydrodynamic) draft model will be revisited following USEPA’s review of the draft model.
  - b. Second-to-last sentence. The text reads as follows: “Sediment loads from point source discharges tend to have relatively high TOC content and are composed of an approximately even mix of fine and coarse particles (see Section 5.3.3 of Appendix G). The East River sediment load has a lower TOC content, and that load is primarily composed of fine sediment particles.” The text should include reference to appropriate tables in the appendices that include data that support these statements (i.e., physical properties including percent fines, percent sands, and organic content) so the reader can develop a general understanding of how sediment load properties vary between the East River and point sources.
  - c. Page 35, third complete sentence: The text reads as follows: “This temporal decrease in NSRs is due to decreases in combined sewer overflow (CSO) sediment loads during the last 50 to 75 years.” Add clarifying text that discusses empirical evidence (e.g., temporally spaced solids concentrations samples from CSO discharges) that support this assertion.
11. Page 35, Section 3.1.6 Sediment Transport, second paragraph, third sentence. The text reads as follows: “Ship and barge traffic lead to localized sediment resuspension, further impacting the dispersal and deposition of sediment and the chemicals sorbed to sediment.” Provide a figure or other representation of recent/current vessel traffic patterns based on information collected to support the prop-wash model and reference the figure in this section.
  12. Section 3.1.7, Habitat. This section must provide a discussion on the importance of the shallow water habitat provided by the study area. New York Harbor has lost the majority of its historical shallow water habitat and, as a result, Newtown Creek and its tributaries provide a unique and locally vital island of critical shallow water habitat for a variety of species.
  13. Page 36, Section 3.1.7 Habitat, first paragraph, first sentence: “...intertidal habitat for wildlife using the study area is very limited.” This statement does not include the bulkheads as potential habitat. In the absence of site-related contamination, the bulkheads, pilings, and rock armor are all suitable habitat for numerous species of invertebrates (e.g., crabs, bivalves, snails, worms, and barnacles) and the species that prey on them. Delete the statement that intertidal habitat is limited.
  14. Page 36, Section 3.1.7 Habitat, first paragraph, second sentence: “...the extent of foraging habitat decreases rapidly as the tide rises and is close to 0% at high tide.” While this may be

true for some species of birds and mammals, it does not address foraging by aquatic species (e.g., crabs, fish, starfish, and aquatic-feeding birds). As the tide fluctuates, there is actually an identical amount of foraging habitat, however it is utilized by a different suite of receptor species. Delete the statement or include a more complete discussion that does not support or describe a decrease in foraging habitat with rising tides.

15. Page 36, Section 3.1.7 Habitat, first paragraph, last sentence: “The intertidal habitat exists primarily as sediment mounds located in the tributaries near CSOs and is primarily composed of sediment deposits from the solids in CSO discharges that settle out following discharge events.” To support this statement, include information in the text regarding the relative proportion of the intertidal habitat represented by “sediment mounds” vs. other intertidal habitat within the Study Area.
16. Page 36, Section 3.1.7 Habitat, second paragraph: The entire paragraph is a discussion of how non-site-related factors have potentially impacted the intertidal and subtidal habitat. However, there is no mention of more than 100 years of industrial activity, numerous oil/chemical spills/releases, multiple underground NAPL sources, ongoing industrial activities, ongoing remedial actions, or the hundreds of sediment and surface water samples that showed elevated concentrations of site-related contamination throughout the Newtown Creek system. The section is unbalanced, and must be revised to include a discussion of the contamination that is a significant cause of impacts to the benthic habitat.
17. Page 37, Section 3.1.8 Ecological Community, second full paragraph, second and third sentences: The biota collections were not exhaustive, and the methods utilized were not capable of collecting all of the different fish and invertebrates utilizing the Newtown Creek system. For example, there are hundreds of rock crabs in view at low tide, but they were not collected. For both fish and crabs, the statements should be revised to: “The dominant fish species, of those collected, are...”, and “The most common species of crab collected in the study area...”
18. Page 37, Section 3.1.8 Ecological Community, third full paragraph: The list of birds, mammals, amphibians, and reptiles is not exhaustive, and other species may utilize Newtown Creek. This paragraph should be preceded by a disclaimer that the wildlife surveys were qualitative, and the species listed are those directly observed during the brief time windows of the actual field surveys.
19. Page 39, Section 3.2 Human Use, second full sentence: Delete the word “generally”.
20. Page 44, Section 3.2.3 Historical and Current Shipping Activity, last sentence: The reference to the Hugo Neu site should be revised to also include a Creek Mile reference.
21. Page 45, Section 3.2.4 Navigation Channel and Dredging History, General section comment. Revise this section to include text describing the full and partial bathymetric surveys available for the site. USEPA notes that full or partial bathymetric surveys are available for the following years at the site: 1991, 1999, 2009, 2 separate surveys in 2011, 2 separate surveys in 2012, 2014, and 2015.
22. Section 3.2.6 Historical Industrial Operations:

- a. This section includes an exhaustive discussion of the history of the types of industries that operated along Newtown Creek. Yet there is limited discussion of chemicals or contaminants associated with the industries and industrial processes, known or potential sources and waste streams, known or potential releases to the creek, and potential migration pathways (if known). All of these industries have the potential to have released contaminants to Newtown Creek in the past. This type of information is relevant to understanding the nature of legacy contaminants in the Study Area sediments and the understanding of the nature and extent of contamination currently observed in the creek. For each of the industry sectors evaluated in Section 3.2.6, include a discussion of the chemicals or contaminants associated with each industry or industrial process, potential sources, known or suspected releases or waste streams, and migration pathways, if known. Known or suspected historical sources should be included in a separate section, which should also include a table summarizing historical sources.
- b. Various industries are discussed and potential waste products are described for each industry. In many instances, (3.6.2.4, 3.6.2.5, 3.6.2.4, 3.6.2.9) disposal of those wastes is termed, “introduced.” Here, and throughout the document, replace “introduced” with “disposed” as the processes described meets the definition of “disposal” in 6NYCRR Part 375.

23. Pages 51-53, Section 3.2.6.2 Animal Rendering, Glue Factories, and Fertilizer Plants:

- a. Page 53, second paragraph. Remove the last sentence, or if it is relevant to the understanding of nature and extent of contamination, move it to a separate section regarding historical sources.
- b. Page 53, third paragraph. Move the paragraph to the section describing historical sources section.

24. Page 54, Section 3.2.6.3 Asphalt Mixing, Mining and Storage Operations, second paragraph: Revise the paragraph to explain the connection between process discharges and potential contaminants associated with the discharges.

25. Page 55, Section 3.2.6.4 Automobile Manufacture, Repair and Service:

- a. First paragraph, first and second sentence. Revise the text to provide evidence and a citation(s) that the automotive manufacture, repair, and service industries used the referenced chemicals.
- b. First paragraph, last sentence. If specific sites had spills or leaks, discuss those specific events and relevant compounds in a separate section regarding historical sources.

26. Page 56, Section 3.2.6.5 Coal Processing, Handling, Storage and Fuel Use, second paragraph: Remove this paragraph. If specific contaminants were introduced directly or indirectly into the creek, they should be discussed in a separate section to support the understanding of the nature and extent of contamination.

27. Page 57, 3.2.6.7 Distilleries:

- a. Second paragraph, second sentence. Explain what a “rectifying” distillery is and how that process is relevant to the RI Report and the understanding of contamination in the creek.
- b. Second paragraph, fourth sentence. Explain what “Lackawanna” coal is and how its use is relevant to understanding of the nature and extent of contamination in the creek. For example would any byproducts from the use of Lackawanna coal result in metals or polycyclic aromatic hydrocarbon (PAH) contamination within Newtown Creek?
- c. Eighth sentence. Discuss specific distillery sites in a separate section relative to the specific discharges.

28. Page 58, 3.2.6.8 Electronics and Electroplating, second paragraph:

- a. Second sentence. Discuss the relevance of these waste streams to the understanding of the contamination in the creek.
- b. Last sentence. Provide evidence for this assertion or remove the sentence.

29. Page 58-59, 3.2.6.9 Incinerators:

- a. Page 58. Revise the text to discuss the relevance of incinerator waste streams to the understanding of contamination in the creek.
- b. Page 58 paragraph 4 and page 59 paragraphs 1-3. Revise the text to relocate discussions of specific sites within a separate section.

30. Page 60, 3.2.6.10 Manufactured Gas Plants:

- a. Second and third paragraph: Revise the text to relocate discussions of specific sites within a separate section.
- b. Fourth paragraph: Revise the text to clearly explain the relevance of this paragraph to the understanding of contamination at Newtown Creek.

31. Page 61, 3.2.6.11 Metal Production, Smelting, and Metal Works Fabricating:

- a. Only copper smelting is discussed in this section. The text should be revised to include discussion of the other metals processed and fabricated along the creek, or the title should be revised to ‘Copper Smelting’, if that was the only metal production, smelting, and fabricating activity along the creek. The potential chemicals and contaminants associated with metal smelting and fabricating operations should be included in the section.
- b. Second and third paragraphs: Revise the text to relocate discussions of specific sites within a separate section.

32. Pages 62-63, 3.2.6.12 Metal Scrap and Storage:

- a. Page 62 paragraph 2 and Page 63, first paragraph: Revise the text to relocate discussions of specific sites within a separate section.
33. Pages 63-64, 3.2.6.13 Paints and Pigments Industry:
- a. Page 63, second paragraph, fifth and sixth sentences and Page 64, first and third paragraphs. Revise the text to relocate discussions of specific sites within a separate section.
  - b. Page 64. Revise the text to discuss the relevance of paints and pigments industry waste streams to the understanding of contamination in the creek. Polychlorinated biphenyls (PCBs) are one of the key contaminants in sediments at the site. The potential presence of PCBs in paints and pigments should therefore be discussed in the text.
34. Pages 64-65, 3.2.6.14 Paper Products Industry:
- a. Page 64, paragraph 4, second sentence. Replace “no fewer than” with “approximately”
  - b. Page 65, second paragraph. Revise the text to relocate discussions of specific sites within a separate section.
35. Pages 66-68, 3.2.6.15 Petroleum Refining and Bulk Storage:
- a. Page 66. Revise the text to discuss the relevance of petroleum refining and bulk storage waste streams to the understanding of contamination in the creek.
  - b. Page 67 and 68. Revise the text to relocate discussions of specific sites within a separate section.
36. Page 68, 3.2.6.16 Plastics Industry:
- a. Paragraph 2, sentence 2. Revise the text to relocate discussions of specific sites within a separate section.
  - b. Revise the text to discuss the relevance of plastics industry waste streams to the understanding of contamination in the creek.
37. Page 69, 3.2.6.17 Printing:
- a. Revise the text to discuss the relevance of printing industry waste streams to the understanding of contamination in the creek.
38. Pages 70-71, 3.2.6.18 Railyards:
- a. Page 70, third paragraph. Revise the text to relocate discussions of specific sites within a separate section.
  - b. Page 71, second paragraph. Provide a reference to support this assertion.
39. Page 71, third paragraph. Revise the text to relocate discussions of specific sites within a separate section.

40. Page 71, 3.2.6.19 Sawmills and Lumberyards, paragraph 4, first sentence. Correct the section reference to 3.2.6.20.
41. Page 72, 3.2.6.20 Shipbuilding:
- a. Paragraph 4. Delete sentences 5 through the end of the paragraph; they are not relevant.
  - b. Revise the text to discuss the relevance of shipbuilding industry waste streams to the understanding of contamination in the creek.
42. Page 74, 3.2.6.21 Solid Waste Disposal and Landfilling:
- a. First paragraph. Provide a reference for this assertion.
  - b. Revise the text to discuss the relevance of solid waste disposal and landfilling industry waste streams to the understanding of contamination in the creek.
43. Pages 74-76, 3.2.6.22 Utilities:
- a. Page 74, second paragraph. Remove sentences 3 through 6; they are not relevant.
  - b. Page 74. Revise the text to discuss the relevance of the utilities industry waste streams to the understanding of contamination in the creek.
  - c. Page 74, third paragraph through page 76, second paragraph. Revise the text to relocate discussions of specific sites within a separate section.
44. Page 76, 3.2.6.23 Waste Oil Refining Operations:
- a. Third paragraph. Revise the text to provide details on the specific activities and processes which encompass waste oil refining operations, and discuss the relevance of the waste streams on the understanding of contamination in the creek.
  - b. Third paragraph and page 77. Revise the text to relocate discussions of specific sites within a separate section.
45. Page 78, Section 3.2.7 Current Upland Activities, Uses, and Marine Facilities: third and fourth paragraphs:
- a. Third and fourth paragraphs: The discussion of access limitations to the Study Area should be consistent with revisions that have been made in the BHHRA (e.g., bulkheads would not limit ability to fish/crab, public access to the Study Area by water is not as limited as by land). Revise “(e.g., bulkheads)” in the first sentence of Paragraph 3 to “(e.g., fences).” Revise the end of the second sentence in Paragraph 3 from “including the opportunities to fish and crab within the Study Area” to “including the opportunities to fish and crab from the shoreline within the Study Area.”
  - b. Third paragraph: This paragraph should also acknowledge that determined members of the public do reside, recreate, and fish in Newtown Creek. People have been observed doing all three, including swimming.

46. Pages 79-84, Section 3.2.8.1 – Historical Discharges to Newtown Creek:

- a. This section includes an extensive discussion of the history and discharges associated with municipal wastewater and stormwater infrastructure including discharges from various types of municipal discharges (direct sewage discharges, combined sewer discharges, stormwater discharges, etc.). In contrast, the discussion of industrial discharges is limited to one paragraph (page 83). Given the long industrial history of Newtown Creek, which includes numerous spills and discharges, the discussion of historical discharges is not balanced. Many of the historical industries surrounding Newtown Creek likely discharged waste to the creek without treatment. A shorter and more succinct discussion of municipal wastewater and stormwater infrastructure would suffice to provide the background relevant to evaluation of the point source discharge data collected during the RI. Revise the text to provide a more balanced discussion of historical discharges to Newtown Creek. The 1960 New York State Department of Health (NYSDOH) report should be reviewed to gather and incorporate additional information regarding historical industrial discharges to Newtown Creek.
- b. Page 79, third paragraph, first sentence. The description of the types of current discharges to Newtown Creek is incomplete. The text should be revised to include those types of discharges presented in the Sources Sampling Approach Memorandum (Anchor QEA 2013). Examples of discharge types include highway runoff, overland flow, and hydrostatic test water.
- c. Page 84, Second full paragraph, last sentence. Remove the reference to “Anchor QEA 2012n” (The DAR); the reference is redundant. The DAR cites the NYCDEP Waterbody/Watershed Facility Plan (NYCDEP 2011) as the primary reference, which is already cited in the last sentence of the paragraph.

47. Page 84, Section 3.2.8.2 Current Discharges to Newtown Creek, first paragraph, fifth sentence. The text indicates that an outfall inventory is discussed in Appendix E, however Appendix E does not include an outfall inventory or discussion. Appendix E includes only data summary tables for point source discharges. Add the point source inventory to Appendix E, or revise the text to indicate the correct appendix.

48. Page 85, Section 3.2.8.2.2 Newtown Creek WWTP Effluent Overflow:

- a. First sentence. Kwan 2014a is referenced as the source of the wet-weather conditions under which discharges from NCB-002 occur. While the reference documents the transmittal of information from USEPA, the source of the information is NYCDEP’s Newtown Creek WWTP Wet Weather Operating Plan, NYCDEP, Bureau of Wastewater Treatment, Capital Project No. WP-283, April 3013. The information on treated effluent discharges to Newtown form NCB-002 is included in Table 2-1 of the NYCDEP Wet Weather Operating Plan (WWOP). Delete the reference to Kwan 2014a and cite the primary reference, which is the NYCDEP WWOP for the Newtown Creek WWTP.
- b. Revise the text of this section to note that flow splitting between the East River discharge and NCB-002 is not under WWTP operator control and is based on flow volume to the plant and the tide elevation in the East River.

- c. Second sentence. The sentence should be clarified to read: “During high flows (wet weather) the discharge from NCB-002 may include...”.
- 49. Page 85, Section 3.2.8.3 Individually Permitted Discharges. Other than the locations in Figure 3-23, this section provides limited information on individually permitted discharges. Similar to sections describing CSO and stormwater discharges, this section should be revised to include the discharge permit numbers, discharge history, and a description of the treatment systems.
  - 50. Page 88, Section 3.2.8.4 Long-term Control Plan and Aeration System, first full paragraph, second sentence. The text states that the aeration system distributes “oxygen” into the water column. Modify the sentence to indicate that the aeration system piping and diffusers distribute air (not oxygen) into the water column in an effort to maintain dissolved oxygen above 3.0 milligrams per liter (mg/L).
  - 51. Page 94, Section 3.2.10.2, the last paragraph. “Jamaican...” should be “Jamaica Water Supply Company”.
  - 52. Page 94, Section 3.2.10.2, the list in the 2nd paragraph. State the pumping rates of the permitted non-potable water supply wells.
  - 53. Pages 94-96, Section 3.2.11. This section should be revised to discuss historical spills and how they may have impacted the creek.

## Section 4 Nature and Extent of Contamination

### General Comments

1. Key Findings, Text Box. Remove the text box from Section 4 and all other sections (Sections 5, 7, and 9). The key findings in the text boxes over-simplify and over-generalize the results and findings of the RI Report. The information in the text boxes should be integrated into the appropriate text sections and tied to the supporting data presented in the respective RI Report sections.
2. Background/Reference Area Evaluation. Comparison of surface sediment and surface water data to background reference areas is inconsistent and is not done in a systematic way. Study Area data and background/reference area data are shown on figures and tabulated in tables, but the interpretation of the Study Area data with respect to the background reference area data is generally left to the reader to infer. Statements to the effect that the data are generally within the range of background concentration or the data are generally higher or lower than background concentration do not provide the level of evaluation needed to support an understanding of the nature and extent of contamination in site media relative to background/reference area concentrations. This is a critical aspect of the RI. A systematic approach should be used that includes statistical methods to assess and compare key contaminant concentrations in Study Area media to appropriate background/reference area concentrations. The comparison should be done for specific creek areas or stretches to understand the distribution of key contaminants within the creek relative to background contaminant levels. The RI report must be revised to provide a more robust and complete evaluation of contaminants in Study Area media with background/reference area contaminant levels.
3. Selection of Contaminants for In-depth Evaluation. Section 4 evaluates three contaminants selected for in-depth evaluation in the RI Report: Total PAHs (TPAH), total PCBs (TPCBs), and copper. These three contaminants were selected because they were identified as COPCs in the draft BHHRA and as contaminants of potential environmental concern (COPECs) in the draft BERA. However, the draft BERA identified PCBs, copper, and lead as contributing to risk at the Newtown Creek Site in addition to PAHs. Similarly, the draft BHHRA concluded that PCBs and dioxins were the primary human health risk drivers, while PAHs and pesticides also contributed to risk. Given that dioxins were considered a primary human health risk driver, and lead and pesticides also contributed to risk, it is not clear why they were not selected for in-depth evaluation in the RI Report. The nature and extent of contamination evaluation in the RI Report should include dioxins, pesticides, and lead as additional contaminants for in-depth evaluation. Any additional COPECs included in the Final BERA as a result of changes made in accordance with USEPA's April 11, 2017 dispute resolution memorandum should also be considered for in-depth evaluation in the Final RI Report.
4. Cross Plots. Note: All cross plots should include regression lines and correlation coefficients to aid in evaluation of the relationship between the presented values.

## **Specific Comments**

1. Page 98, Section 4.1 Introduction. This section indicates that the nature and extent of contamination in the Study Area and reference areas is based on concentrations of CERCLA hazardous substances in site media. However, footnote 19 states that “Contamination refers more generally to CERCLA hazardous substances that are the focus of this RI Report as well as other chemical and biological constituents that are relevant to this investigation. Other pollutants and contaminants besides CERCLA hazardous substances are considered in the other sections of this report.” This statement is very vague and raises a number of questions:
  - a. Describe the “other chemical and biological constituents” that are considered “contaminants” in addition to CERCLA hazardous substances and why they are relevant to the RI Report.
  - b. Explain what the “other pollutants and contaminants” consist of and where in the RI Report they are described and evaluated.
  - c. If the “other pollutants and contaminants” are pharmaceuticals, personal care products, and pathogens (the 3P’s), these constituents were excluded from evaluation in the Human Health and Ecological Risk assessments and should also be excluded from evaluation in the RI Report. The phrase “other pollutants and contaminants” is used multiple times in Section 7 - Risk Assessment Summary of the RI Report without defining what pollutants and contaminants are being referenced. The RI Report must define the specific constituents that are considered to be “pollutants and contaminants” and the rationale supporting their evaluation in the RI Report or they should be removed from the report.
2. Page 98, Section 4.1.2 Selection of Contaminants for In-depth Evaluation: As stated in General Comment #3, the contaminants selected for in-depth evaluation should be revised to include all contaminants that present risk in either the BHHRA or the BERA. For example, dioxins and furans (as 2,3,7,8-TCDD toxicity equivalents [TEQs]) are present at concentrations greater than 10 times the sediment screening level (SL) of 0.85 picograms per gram (pg/g) in nearly all surface sediment samples collected from Newtown Creek. The nature and extent of contamination evaluation should include dioxins, pesticides, and lead in the RI Report as additional contaminants for in-depth evaluation.
3. Page 98, Section 4.1.2 Selection of Contaminants for In-depth Evaluation, first paragraph, second sentence. It is stated that the RI Report focuses primarily on concentration data for three chemicals in sediment, water, and tissue (TPAH, TPCB, and copper). Clarify in the text whether the term “water” in this sentence refers to all water samples collected during the RI including surface water, groundwater, porewater, point source discharge water, etc.
4. Page 98, Section 4.1.2 Selection of Contaminants for In-depth Evaluation, first paragraph, third sentence. The sentence states: “These three constituents have been identified to characterize the nature and extent of environmental impacts in the Study Area, based on the results of the human health and ecological risk assessments and direction from USEPA.” Strike “and direction from USEPA” from this sentence.

5. Page 99, third bullet. The bullet states: “Copper is included, per USEPA’s request...”. Strike “per USEPA’s request” from the sentence.
6. Page 100, Section 4.1.3.1 TPCB in Surface and Subsurface Sediment and Native Material, second paragraph, third sentence. There was some discrepancy between the NCG and USEPA split samples with respect to the Aroclor(s) identified at the site. Aroclor 1016 and 1260 were identified by the USEPA laboratory, while Aroclor 1242 and 1254 were identified by Anchor QEA. The RI report should describe potential reasons for this discrepancy (e.g., mixing and degradation of the various PCB Aroclors) and how the discrepancy in Aroclor identification affects the interpretation of PCB data including quantification and the evaluation of sources and migration pathways.
7. Page 101, Section 4.1.3.3 TOC, third sentence. This sentence indicates that the explanation for low TOC results in Phase 1 are captured in Appendix B. Appendix B indicates that the TOC discussion is captured in the RI. Please rectify or clarify this disconnect. In addition, regardless of where the Phase 1 TOC issue is discussed, it needs to be captured/summarized in RI Section 2.3 and Table 2-2b.
8. Page 103, Section 4.1.3.5 Surface Water Particulate Phase Concentrations:
  - a. Second and third paragraphs. Throughout the RI investigation there have been issues identified with the total suspended solids (TSS) results. These issues need to be identified here along with the potential impact on the referenced calculations.
  - b. This section should include a discussion of how additional COPCs in the particulate phase, such as pesticides, were evaluated. Calculations of partitioning coefficients are not performed for chemicals other than PAHs and PCBs in the appendices.
9. Page 107, Section 4.2.2 Percent Fines and TOC, second paragraph, third sentence. It is stated that “In addition, there are major sources (CSOs and municipal separate storm sewer systems [MS4s]) of organic matter and solids within the tributaries, as well as at the downstream boundary at the East River, and there are anthropogenic forms of OC in the surface and subsurface sediment.” The discussion of sources of organic matter and solids should not be limited to CSOs and MS4s. Other sources of organic matter and solids such as direct discharges from surrounding properties and overland flow during rain events should also be included. Revise the text to include the full range of source types contributing organic matter and solids to Newtown Creek.
10. Page 108, Section 4.2.2.1 Percent Fines:
  - a. This section states that lower percent fines are generally found at the upstream end of tributaries near CSO discharges, which suggests that coarser materials are related to CSO discharges. The distribution of percent fines varies widely throughout the Study Area and there is significant overlap in percent fines data in the various reaches and tributaries. In addition, percent fines data for reference areas (Figures 4-5 and 4-6) generally significantly overlap those in the Study Area regardless of the presence or absence of CSO discharges in the reference areas. Data collected during the point source investigation should be analyzed and included in the RI Report as an additional line of

evidence to support the conclusion that coarser sediments are related to CSOs at the head of tributaries.

- b. Figure 4-4 presents percent fines distribution in surface sediment based on quartiles. This results in variable ranges of percent fines levels presented in the figure. For example, the first bin covers percent fines from 1.4 to 40% (range of 38.6%), while the percent fines in the other bins range from 6 to 17 percent fines. The basis for and implications of the use of quartiles to present the percent fines data should be discussed in Section 4.2.2.1.

11. Section 4.2.2.2 TOC:

- a. Page 108, first sentence. It states that the Study Area TOC ranged from 3-15%, however Table 4-3 shows a range of 0.23-20%. Resolve the inconsistency.
- b. Page 108, second sentence. The text states that 4% TOC is high “compared with aquatic systems that do not have strong local sources of organic matter”. The word “strong” should not be used within this comparison. Further, this statement is misleading due to an inappropriate equivalence – saying 4% TOC is high relative to a system without a source of organic matter is irrelevant. The first part of the sentence sets up the second part, “...and are consistent with high organic loads from the large CSOs”, which infers that CSOs are the source of contamination, which was shown by the BERA to be untrue. Additionally, Table 4-3 shows that 8 out of the 14 reference areas had an average TOC greater than 4%. The entire statement should be deleted.
- c. Page 108, third sentence. “The spatial distribution of surface sediment TOC provides further evidence of the key role played by the CSOs in discharging organic matter into the Study Area.” Section 4.2.2.1 (second to last sentence) says that a lower percentage of fine sediment is found near the CSO discharges (except Whale Creek), indicating that the fine particles from the CSOs are not the primary source of TOC in the tributaries. The sentence needs to be revised.
- d. Page 108, fifth sentence. The text states that the 14 reference areas exhibit TOC in the range of 1-5%, however Table 4-3 shows a much wider range of TOC, and the arithmetic average concentrations range from 1.8-9.2%. The sentence needs to be revised.

12. Section 4.2.2.3 Relationship between Percent Fines and TOC:

- a. Page 109, third paragraph. Figure 4-10b, middle panel: the plotted data appear to be a random scatter plot; to say that there is a positive relationship is misleading. Further, removing the four samples NCG states to be unusually high would not result in a positive, significant correlation between TOC and percent fines. Inferring that the CSOs have something to do with the TOC/fines results not conforming to NCG’s preconception is not supported. This paragraph should be deleted.
- b. Page 109, fourth paragraph. It states that there is an inverse relationship in the Study Area between percent fines and TOC, however Figure 4-10b, left panel, does not appear

to show a significant relationship. Statistical analysis is required to support the statement.

- c. Page 109, fourth paragraph. It states that Figure 4-10b, right panel, shows two overlapping clusters that indicate the further downstream samples are related to sediment deposited by the East River. The right panel also appears to be a random distribution, and without statistical analysis, there does not appear to be any significant relationship. Stating that the East River is the source of sediment at the downstream end of Newtown Creek is not supported by these data. Either show a significant, positive statistical relationship, or state that there is no relationship.
  - d. Page 110, first full paragraph. It states that the percent fines and higher TOC in Flushing Creek, Coney Island Creek, Fresh Creek Basin, and Sheepshead Bay samples are similar to the Study Area tributaries, which is consistent with the influence of large CSOs in those reference areas. While those four reference locations may indicate the lower fines/higher TOC relationship, the other 13 reference areas do not show the same relationship, nor do the presence of CSOs indicate higher TOC (Westchester Creek, Brooklyn Navy Yard, Spring Creek, and Throgs Neck all have CSOs and low TOC). The text, tables, and graphs used to describe the relationship between percent fines, TOC, and CSOs are biased and not supported by the data, and must be revised.
  - e. Page 110, Summary bullets. The bullets are not supported by the data as presented. Further statistical analysis must be provided to support the assertions that the downstream end of Newtown Creek is impacted by the East River, and the upstream ends of the tributaries are impacted by CSOs. Without such analysis, the current text is misleading and must be revised to more objectively reflect the data.
13. Page 112, Section 4.2.2.4 TOC Composition, last sentence. The MAM3 document is a draft document under USEPA review. Revisions required for that document may need to be incorporated here and in Section 6.6.
14. Section 4.2.3.1 TPAH:
- a. Page 112, first paragraph. Detail how the 95/95 upper tolerance limit (UTL) from the reference area locations was calculated and include the data, equations, and/or what statistical software was utilized.
  - b. Page 112, first paragraph. This section briefly presents vague information regarding background concentrations of TPAH and refers the reader to multiple figures to identify what the calculated TPAH background value is. At a minimum, the discussion of background should be expanded to include a description of the dataset, addresses whether the data are normally distributed, what statistics were used to justify the calculations of background, the final background value, etc. (also see Section 4, general comment no. 2).
  - c. Pages 112 and 113, bulleted items. The range of TPAH concentrations should be provided in each bullet and corresponding reach/tributary of the study area.

- d. Page 113, first four bullets. The descriptions of English Kills, East Branch, Maspeth Creek, and Dutch Kills indicate that TPAH concentrations are higher in the main stem of Newtown Creek, particularly in the Turning Basin area. This does not coincide with NCG's claim that the CSOs are a primary source of contaminants; this should be included as a bullet.
15. Page 113-114, Section 4.2.3.2, TPCB.
- a. Bullet items: The bullets indicate essentially the same pattern of contamination as was described for TPAH in Section 4.2.3.1. Again, this does not coincide with NCG's claim that the CSOs are a primary source of contaminants; this should be included as a bullet.
  - b. Bullet items: The range of TPCB concentrations should be provided in each bullet and corresponding reach/tributary of the study area.
  - c. See previous comment No. 14b above regarding determination of background.
16. Page 114-115, Section 4.2.3.3 Copper, bullets.
- a. The bullets indicate essentially the same pattern of contamination as was described for TPAH in Section 4.2.3.1 and TPCB in Section 4.2.3.2. This does not coincide with NCG's claim that the CSOs are a primary source of contaminants; this should be included as a bullet.
  - b. The range of copper concentrations should be provided in each bullet and corresponding reach/tributary of the study area.
17. Page 115, Section 4.2.4 Impact of Recent NYC Navigational Dredging on Surface Sediment Chemical Concentrations, first paragraph, second sentence. The text reads as follows: "Multiple samples were collected from ten locations to characterize the sand cover material placed following dredging and the sediment layer just below the sand cover." The text should be expanded to discuss when the sand cover was placed (e.g., one day after dredging, one week after dredging, etc.), the thickness of the placed sand cover (including any confirmation cores or other measuring technique used to confirm the sand layer thickness), and a specific discussion of the originally placed sand layer thickness with respect to sand thicknesses identified in the Phase 2 cores, including presentation of these two sets of measurements as a table in this section. The text should also include the measured thickness of the surface sediment layer above the sand layer at each location.
18. Page 115, Section 4.2.4 Impact of Recent NYC Navigational Dredging on Surface Sediment Chemical Concentrations, second paragraph, first sentence. The text reads as follows: "Surface sediment concentrations from locations with no discrete sand cover are generally consistent with nearby Phase 1 and Phase 2 surface sediment data for TPAH, TPCB, and Cu. Surface sediment concentrations at locations with variable sand cover are generally lower than nearby Phase 1 and Phase 2 surface sediment data for TPAH, TPCB, and Cu (see Tables 4-7a and 4-7b)." Expand Tables 4-7a and 4-7b to include the analytical chemistry results for both surface and subsurface sediment for each individual coring location. For each location, also include the measured thickness of the sand layer (if present), and the relative locations

of where the surface and subsurface sediment samples were collected in relation to the sand layer (e.g., surface sediment sample collected 6-inches above top of defined sand cover layer).

19. Page 116, Section 4.2.5 PAHs, PCB, and metals composition and speciation. This section needs to include a presentation and analysis of bulk sediment copper concentration along with other bioaccumulative COPCs.
20. Page 117, Section 4.2.5.1 PAHs, first paragraph. This paragraph references the differing ratios of LPAH to HPAH in some regions of Newtown Creek. Additional discussion should be included that provides the reader with information about the locations where ratios differ and what that might indicate about sources. For instance, one region where the LPAH to HPAH ratio is quite different from the reference areas is the Turning Basin (CM 2+). Does this indicate that there is a source of different PAHs in the Turning Basin?
21. Page 119, Section 4.2.5.2 PCBs, first paragraph. This paragraph states that there are different sources of PCBs to Newtown Creek based on the chlorine per biphenyl (CPB) ratio. This is likely true but there should be additional information included in the text that addresses the potential of an ongoing source that has released PCBs over time causing some to be more dechlorinated, or “weathered,” in portions of the creek.
22. Page, Section 4.2.5.3 SEM, first paragraph. The first paragraph presents an analysis of AVS and SEM. AVS is extremely sensitive to the presence of oxygen. Indicate whether dissolved oxygen (DO) was measured as part of this analysis and if impacts of DO on AVS were considered.
23. Page 121, Section 4.3.2.1 Percent Fines, first paragraph, second sentence. The text reads as follows: “Lower fine sediment contents are generally found at the upstream ends of the tributaries near the CSO discharges (except for Whale Creek).” Revise the report to include a series of map figures (per Study Area) that display the locations of CSOs and industrial facilities, the sediment sample locations, and the percent fine summary statistics with depth at each location, with references to these new figures within this text section. Pending USEPA’s review of these figures, the RI text may require revisions to include discussions of discernable localized patterns in percent fines relative to specific sources of contamination and the hydrodynamics of Newtown Creek.
24. Page 121, Section 4.3.2.2 TOC, first paragraph, last sentence. The text reads as follows: “This pattern suggests higher historical organic loads from CSOs, as well as industrial facilities, combined with the depositional nature of the system.” Revise the report to also include a series of map figures (per Study Area) that display the locations of CSOs and industrial facilities, the sediment sample locations, and the TOC summary statistics with depth at each location, with references to these new figures in this text section. Pending USEPA’s review of these figures, the RI text may require revisions to include discussions of discernable localized patterns in TOC.
25. Page 122, Section 4.3.2.3 TOC Composition, General section comment. Revise the report to also include a series of map figures (per Study Area) that display the locations of CSOs and industrial facilities, the sediment sample locations, and the PAH/TOC/soot carbon summary

statistics with depth at each location, with references to these new figures in this text section. Pending USEPA's review of these figures, the RI text may require revisions to include discussions of discernable localized patterns in PAH/TOC/soot carbon.

26. Pages 122 and 123, Section 4.3.3.1 TPAH:

- a. General section comment. Revise the report to also include a series of map figures (per Study Area) that display the locations of CSOs and industrial facilities, the sediment sample locations, and the TPAH summary statistics with depth at each location, with references to these new figures in this text section. Pending USEPA's review of these figures, the RI text may require revisions to include discussions of discernable localized patterns in TPAH.
- b. Page 123, first paragraph. This paragraph should include the range of TPAH in subsurface sediment of between 10,000 and 100,000 ppm rather than requiring the reader to refer to figures for this basic information.
- c. Page 123, bulleted items. The range of TPAH concentrations should be provided in each bullet and corresponding reach/tributary of the study area.

27. Section 4.3.3.2 PCBs:

- a. General section comment. Revise the report to also include a series of map figures (per Study Area) that display the locations of CSOs and industrial facilities, the sediment sample locations, and the PCB summary statistics with depth at each location, with references to these new figures in this text section. Pending USEPA's review of these figures, the RI text may require revisions to include discussions of discernable localized patterns in PCB.
- b. Page 124, bulleted items: The range of PCBs concentrations should be provided in each bullet and corresponding reach/tributary of the study area.

28. Section 4.3.3.3 Copper

- a. General section comment. Revise the report to also include a series of map figures (per Study Area) that display the locations of CSOs and industrial facilities, the sediment sample locations, and the copper summary statistics with depth at each location, with references to these new figures in this text section. Pending USEPA's review of these figures, the RI text may require revisions to include discussions of discernable localized patterns in copper.
- b. Page 125, bulleted items. The range of copper concentrations should be provided in each bullet and corresponding reach/tributary of the study area.

29. Page 127, Section 4.3.4.2, High Resolution Cores, bulleted items. The bullets on this page generally present only observations of the surface sediment although samples were collected down to 60 cm. COPC trends in the lower portion of the core should be compared to the upper portion of the cores.

30. Page 128, Section 4.4.2, fourth sentence and Figure 4-37. The text states that TPH concentrations generally range from 1 to 100 milligrams per kilogram (mg/kg) (see Figure 4-37). While this is true for the majority of the native material samples, there are at least 16 locations that have significantly elevated TPH concentrations (greater than 100 mg/kg) including a few locations greater than 10,000 mg/kg. These elevated TPH concentrations and their locations should be discussed in the text including any relationship to NAPL observed (visual and/or shake tests) in the native material. In addition, the text should indicate if the TPH data presented for native material does or does not include the National Grid cores.
31. Page 130, Section 4.5.1, Sediment Trap Dataset, third sentence: The text states that “Sediment traps collected depositing solids that are likely derived from multiple sources, including point source discharges (i.e., CSO and stormwater), local sediment resuspension, and the East River.” Delete the parenthetical phrase (i.e., CSO and stormwater) or provide a more comprehensive list of sources that could contribute to depositing sediment such as overland flow (known to have high solids concentrations based on point source sampling), propwash, bioturbation, industrial discharges, etc.
32. Page 131, Section 4.5.2.1, Gross Solids Deposition:
- a. First sentence, including footnote 36. The discussion of what solids are collected in the sediment traps is unclear. The inference in Footnote 36 suggesting that not all settling particles intercepted by the sediment traps would otherwise reach the sediment must be explained. If this is true, then the value of sediment traps as a surrogate for sediment deposition seems suspect and brings into question the validity of the comparison of sediment trap data to surface sediment data in Section 6.4.3.2. It should also be noted in the text that sediment traps tend to overestimate sediment deposition rates because material is trapped that otherwise might not be trapped and because trapped material is not available to be eroded or transported. At best, sediment traps can be used to distinguish relative accumulation rates among trap locations.
  - b. Last paragraph. This paragraph indicates that gross deposition fluxes from sediment traps were qualitatively compared to other lines of evidence (e.g., geochronology data) used to understand net sedimentation rates (NSRs) as part of sediment transport modeling (Section 5 of Appendix B Final Modeling Result Memorandum [FMRM]). This is inconsistent with the statement in the first paragraph of Section 4.5.2.1 that sediment traps do not necessarily represent long-term NSRs in the Creek bed. It also seems that, other than presenting the sediment trap data graphically in the FMRM and indicating a general decreasing trend in the solids from upstream to downstream, there was no real comparison (qualitative or otherwise) of the sediment trap data with geochronology data. Further discussion is required within the text to clarify the objectives and uses of sediment trap data for evaluating chemical fate and transport and as a line of evidence supporting development of long-term NSRs. In our view, because of the method of sediment trap collection employed, direct comparison of the sediment trap data to NSRs is not valid.
33. Section 4.5.3 Distribution of Contaminants:

- a. Pages 133 through 136, bulleted items. Similar to previous comments, the range of COPCs (TPAH, PCB, copper) concentrations should be provided in each bullet and corresponding reach/tributary of the study area.
  - b. Page 134, first paragraph – Indicate if there a seasonal variation in vessel traffic. If so, include discussion on whehter such variation might explain the seasonal variations in TPAH and the lack of seasonal variation in PCB concentrations.
  - c. Page 135, paragraph 4.5.3.2.2 – This paragraph concludes that PCB concentrations do not have seasonal variations. It should also be noted that point source particulate phase PCB concentrations range approximately between 0.1 and 1.0 mg/kg (Figure 6-12a) while the sediment trap PCB concentrations above CM 2 are greater than 1 mg/kg (Figure 4-69). This likely indicates resuspension of existing, more contaminated sediment is a significant component of the sediment trap sample. This should be discussed in the text.
34. Section 4.6, General Comment. Comments in the May 2016 review of the April 1st Category 2/3 NAPL evaluation stated that “Gaps in the NAPL data will be clearly identified in the RI report.” There were few if any NAPL data gaps identified within the text or in Appendix C. The text should be revised to clearly identify each recognized NAPL data gap. In addition, the text should include a statement that additional NAPL data collection activities will be completed to support the FS.
35. Section 4.6.1 NAPL Dataset and Evaluation Approach:
- a. Page 137, second paragraph. Remove the reference to “Kwan 2014b” from the text. The text should cite the original document, not an e-mail transmitting the document.
  - b. Page 137, Section 4.6.1 last paragraph, third line from the bottom. “2-ounce polystyrene jar, shaken, and allowed to equilibrate for 10 minutes”. The text should be revised to state how long and how vigorously the sample was shaken in the shake test, and whether this was standardized or comparable between individuals performing the test.
  - c. Page 139, Second full paragraph, second sentence. Rewrite the sentence to state “The most notable visual and shake test observations, over all depths observed at each core location in sediment and native material, are shown in Figures 4-75 and 4-76, respectively.”
  - d. Page 139, Last full paragraph, second sentence: Add “also” to the parenthetical reference “The specific categories developed for this effort included Category 1A, Category 1B, and Category 2/3, as further described in the following (see Figure 4-77).” Delete the third sentence starting with “For example,” as it is confusing before the bullet list that includes the definitions of the specific categories. Incorporate the observations provided in the last sentence into the bullet listed items.
  - e. Page 140: First hyphen. The number of shake tests that result in sheens (Free Phase Hydrocarbons [FPHC]) should be included here and the total number with sheens should be broken down into surface and subsurface sediment.

- f. Page 140, Last full paragraph, third sentence. Rewrite as “The four Phase 1 cores that were shake-tested during the Phase 1 program and had shake-test layer results...”
  - g. 31. Page 140: First hyphen – the number of shake tests that result in sheens (FPHC) should be included here and the total number with sheens should be broken down into surface and subsurface sediment.
  - h. Page 140, Last full paragraph, last sentence. The text should be revised to more clearly explain why Categories 2 and 3 were ultimately combined and why it is not necessary to provide this distinction. The phrase “Based on the nature of the NAPL observations” by itself is not sufficient.
  - i. Page 141, First full paragraph, second sentence. The value ‘42’ should be revised to ‘23’ as it references the cores classified as Category 2/3 in the preceding paragraph.
  - j. Page 141, Section Figure 4-78. The figure should be revised to include boundaries for the Category 2/3 areas presented.
36. Pages 141 to 142, Section 4.6.3 Subsurface Sediment, sentence beginning with “Bleb observations in cores...”. Confirm whether this statement is true for CM 1.7 or if an exception to the statement needs to be made for that location.
37. Page 142, Section 4.6.3.2 Turning Basin Category 2/3 Area. The text includes “0.3 foot (10 cm) to 9 feet thick”; the text should consistently use English or Metric measurements or consistently provide both. Note: in Section 4.6.3.1, only metric units are given.
38. Page 145, Section 4.7.2.1 Salinity, fourth and eighth sentences. In addition to freshwater inputs from point sources and overland flow, the text should include precipitation falling directly onto the Creek.
39. Page 145, Section 4.7.2.1 Salinity. The text and Figure 4-81 compare salinity differences in shallow and deep surface water samples, yet neither the text nor the figures define the depth intervals of the shallow or deep samples. Include a table showing the depths or depth ranges for the salinity measurement in the various stretches of the creek. Measurement and/or sample collection depth should also be provided for the shallow/deep data evaluations in Sections 4.7.2.2 and 4.7.2.3.
40. Page 146, Section 4.7.2.1 Salinity. The text refers to Section 6.2 and Appendix G for additional discussion of salinity, however the discussion in Section 6.2 focuses on modeling aspects of salinity. Explain the relevance of salinity to the discussion of the nature and extent of contamination. If salinity is an important factor in the discussion of the nature and extent of contamination, then a full discussion should be presented in Section 4.7.1.2.
41. Page 146 and 147, Section 4.7.2.2 Organic Carbon:
- a. Second paragraph, last sentence. The text indicates little difference in particulate organic carbon (POC) values between Rounds 1 and 2, however the data presented in Figure 4-83 does not support this conclusion. The Round 2 POC data for many of the stream stretches (CM 0-1, CM 1-2, CM2+, and English Kills) appear to be very close to or

within the boundaries of the dry-weather data. In addition, in nearly every stream stretch, the mean values for Round 2 are lower than those in Round 1. Revise the text to reflect these differences between Rounds 1 and 2.

- b. Third paragraph, last sentence: The increase in the fraction of organic carbon ( $f_{oc}$ ) during wet weather is attributed to point source loads, particularly higher organic inputs from CSOs. This conclusion is made without supporting data. Actual point source discharge POC and  $f_{oc}$  concentration data should be discussed in the text and evaluated to determine if the data supports the conclusion that the increase in wet-weather  $f_{oc}$  is related to CSO discharges.
- c. Last Paragraph. The Contamination Assessment and Reduction Project (CARP) data and NYC Harbor Water Sampling Program dissolved organic carbon (DOC) data that were referenced in Table 2-1 and used for comparison with the Phase 2 wet-weather DOC data must be provided in the RI Report.

42. Page 147, Section 4.7.2.3 Total Suspended Solids:

- a. This section concludes that lower TSS concentrations in Round 2 relative to Round 1 are indicative of solids input from point source discharges. This conclusion is not supported by the data presented in Figures 4-87 and 4-88. Although the Round 2 TSS data are generally lower than the Round 1 TSS values, the Round 1 values are generally lower or very similar to the dry-weather values. The data could equally be interpreted as point source discharges lowering TSS during wet-weather relative to dry-weather and East River TSS levels (dilution). Point source TSS data is relevant and needs to be evaluated and brought into this discussion. Remove from the text the conclusion that the higher Round 1 TSS relative to the Round 2 levels is indicative of solids input from point sources.
- b. Figure 4-88. Surface water samples were collected periodically (monthly) during Phase 1, without regard to weather. Indicate if any of the Phase 1 monthly surface water sampling was conducted during or immediately following wet weather.

43. Page 148, Section 4.7.3.1.1 Spatial Distribution, bulleted items. TPAH data in this section, and all sections, should include evaluation and discussion of the data with respect to reference area concentrations. The first bullet discusses the data with respect to reference areas, yet the second and third bullets do not provide the same context.

44. Page 150, Section 4.7.3.2.1 Spatial Distribution:

- a. Page 150, last paragraph. The conclusion to this paragraph states that there is no systematic difference related to sampling depth. However, Figure 4-90 appears to indicate that in the tributaries, at higher concentrations (greater than about  $0.3 \mu\text{g/L}$ ), the bottom samples appear to be more impacted than shallower samples. This should be discussed in the text. Revise the conclusion accordingly.
- b. Bulleted items. The temporal distribution of TPCB in surface water in the main stem locations (CM0-1 and CM 1-2) appears different than the temporal distribution of TPAH

in main stem locations. TPCBs show a general trend of higher TPCB during summer months (Figure 4-96), whereas TPAH concentrations in the main stem do not show any seasonal patterns (Figure 4-91), but show some seasonal increases in English Kills and Dutch Kills during the summer months. Include a discussion of these differences in seasonal patterns in the RI Report including discussion of the temporal differences as they relate to sources in the creek bed vs. sources derived from point source inputs.

- c. Bulleted items: A range of COPC concentrations should be provided for the three bullets in this section.

45. Page 155, Section 4.7.4.2.1 Spatial Distribution, first bullet, first sentence. The statement as written is misleading in that it conflates the comparison of TPCB concentrations in English Kills with both the main stem and other tributaries. Arithmetic average TPCB concentrations in English Kills are approximately 1.4 to 2 times the TPCB arithmetic averages in main stem areas. Arithmetic average TPAH concentrations in English Kills are approximately 1.6 to 2.7 times the TPCB arithmetic averages in the other tributaries. Revise the text to clarify the comparisons of English Kills TPCB vs. main stem areas and the other tributaries.
46. Page 155, Section 4.7.4.2.2 Comparison between Round 1 and Round 2 Sampling, last sentence. Provide the rationale and basis for the judgement that the TPCB concentrations are most similar for Events 1 and 3. By visual inspection, Events 4 and 5 could also be considered similar. In addition, describe the significance of this comparison in the context of understanding the nature and extent of contamination. Remove the sentence or provide further analysis and support for the statement, including consideration of the rainfall amounts during the various events.
47. Page 156, Section 4.7.4.3.2 Comparison between Round 1 and Round 2 Sampling, last sentence. Based on the cross plots presented (Figure 4-107), Event 5 is the only event where the majority of sampling results were greater in Round 2 than in Round 1, yet the box plots (Figure 4-106), show that Round 2 copper concentrations are generally higher for most creek stretches during Round 2 vs. Round 1. Event 5, then, must be a driver for the higher copper concentrations observed during Round 2. Evaluate whether any of the conditions during Event 5 might be responsible for the copper sample results being greater during Event 5 than during the other events.
48. Page 158, Section: 4.8.1 Porewater Dataset, first paragraph, second sentence. The text reads as follows: "Porewater originates as surface water from above or groundwater from below, and represents a mixture of those two waters; the relative amounts depend on rates of groundwater movement and tidal exchange." Revise the text to read as follows: "Porewater originates as surface water from above or groundwater from below, and may represent a mixture of those two waters; the relative amounts depend on rates of groundwater movement and tidal exchange."
49. Page 158, second bullet. This bullet puts too much emphasis on the purpose and use of porewater. Delete the portion of the comment following "... to which benthic organisms are exposed".

50. Page 159, Section: 4.8.2.1 Salinity, first paragraph, first sentence. The text reads as follows: “Porewater salinity is useful to understand the nature and source of sampled water because porewater within the surface sediment of a coastal aquatic system can represent a mixture of more saline water from tidal surface water, and freshwater from groundwater in locations where it is discharging to the surface water.” Add clarifying text on the potential for groundwater contaminated with salts to impact analytical measurements of porewater salinity.
51. Page 159, Section: 4.8.2.1 Salinity, first paragraph, second sentence. The text reads as follows: “Salinity in shallow porewater<sup>45</sup> samples from the Study Area ranges from 3.7 to 22 practical salinity units (psu), with an arithmetic average of 18 psu (see Table 4-34).” Revise this sentence to directly note in the text (beyond the footnote) that these measurements were taken in the laboratory as part of the triad program. The revised text should also include a discussion of how in situ and laboratory measurements of salinity in porewater from the “same” sample could vary (e.g., impacts from transporting the sample from the field to the laboratory), if this variation is possible. Note which measurements were taken in situ, and which measurements were collected in laboratory experiments on the associated Table 4-34.
52. Page 160, Section: 4.8.2.2.1 TPAH Spatial Distribution; Page 160, Section: 4.8.2.2.2 TPCB Spatial Distribution; and Page 161, Section: 4.8.2.2.3 Copper Spatial Distribution, General 4.8 section comment. Revise the report to also include a series of map figures per study area segment that shows all surface sediment, subsurface sediment, porewater, and groundwater concentrations for each individual COPC identified in General Comment 3 to aid the reader in understanding the interplay between the various strata and matrices, as well as contaminant distributions. This series of requested maps would be prepared for the following Study Area Segments (or whatever study area segments are identified in the final RI): CM 0 to 1.2, CM 1.2 to 2.6, CM 2.6+, Dutch Kills, Whale Creek, Maspeth Creek, East Branch, and English Kills. Pending USEPA’s review of these figures, the report text may require revisions to include discussions of discernable localized contaminant patterns.
53. Section s 4.8.2.2.1 and 4.8.2.2.2, bulleted items. The bullets in these sections should contain ranges of COPCs.
54. Page 166, Section 4.9.1 Groundwater Dataset, second paragraph. A discussion of colloidal transport should be added. Colloidal transport can be an important mechanism for the migration of PAHs and PCBs in porous media. The use of dissolved phase concentrations alone is a non-conservative estimate of contaminant loading for these organic compounds. If there is a concern that “total” analysis using unfiltered samples would bias the results high, explain why the results were not bracketed between total and dissolved concentrations.
55. Page 167, Section 4.9.2.1 Spatial Distribution, second paragraph. Provide the typical range of TSS in ambient groundwater to justify the statement included in the last sentence.

56. Section 4.9.3, multiple pages. All of the bulleted lists in this section should contain ranges of applicable COPCs instead of using qualitative terms such as concentrations are “higher” or “lower.”
57. Page 169, Section 4.9.3.1.1 Spatial Distribution, paragraph following bulleted list. If impact by NAPL is a concern, provide a comparison of the solubility limits of individual PAHs to the values detected or calculated at these locations. Dissolved phase concentrations that have been impacted by free or residual saturation should be counted as part of groundwater loading.
58. Section 4.10.1 - Tissue Dataset; Section 4.10.2.1 Fish and Crab; Section 4.10.2.2 Bivalves; and Section 4.10.2.3 Benthic Invertebrates. Figure 2-19 has too many symbols that overlap. It is not possible from the figure to understand where tissue samples were collected. The figure must be revised and/or broken into multiple figures.
59. Page 175 through 178, Section 4.10.3, bulleted items. Bulleted descriptions of the tissue dataset should include ranges of the COPCs.
60. Page 176, Section 4.10.3.2 TPCB, first sentence. Box plots, on a log scale, are used to compare the Study Area to the Reference Area tissue PCB concentrations. The use of a log scale compresses the spread of the data to infer that there is little/no difference between the Study Area tissues and the Reference Area tissues. While tissue concentrations are variable, and there is some overlap in the individual species, the use of an arithmetic scale would give a more representative visual representation of the differences between the Study Area and the Reference Area tissues. The figure should be revised.
61. Page 179, Section 4.11.1 Background Data Sources, second paragraph. The impact of the detected background concentrations on the evaluation of the air sample data results for the Study Area needs to be clearly summarized in this section. For example, the concentrations for benzene in several background locations exceed the USEPA regional screening level. USEPA previously commented on contaminant concentrations of selected background locations in comment No. 2 of the October 22, 2015 Air Presentation, Comment/Response Matrix. The limitations of the background samples need to be captured in this section.

## **Appendix C**

1. Appendix C, General Comment. This appendix was difficult and tedious to review. It includes extensive and redundant discussion on methodology with minimal substance on findings and discussion of NAPL distribution as would be expected in Section 4 – Nature and Extent of Contamination. Work Plan approaches and methodology details should be discussed in Section 2 – Program Summary.
2. Appendix C, Cross sections. The cross sections should be revised to improve clarity. It would be clearer if No Recovery (currently white) was indicated by a hatch mark pattern so it was clear where no data are available. The No Visible Observation (currently grey) could be white, and the presence of sheen and other observations of impacts noted as grey or another dark color. This is true of the shake test results as well. Finally, indicate in a legend that the grain size observations are placed besides the borings.

3. Figure C4-3. This figure does not extend downstream far enough to plot borings DK041SC-A and DK12SC-A which are presented on Figure C4-4.
4. Page 20, Section 3.2 Sediment lithology, second full paragraph, last sentence. Follow up on “...based on visual observations” to describe any standardization or quantification of the visual observations either by training of field personnel on sample descriptions or by use of grain size sieves or analyses.
5. Page 24, Section 3.3.3 Native Material, bottom of the page. Include a discussion regarding the stratigraphy/grain size of the deep NAPL observation.
6. Page 28, Section 4 Evaluation and Interpretation. Some discussion is warranted regarding observations around the areas that USEPA identified as NAPL-containing and why two of the five were not carried through as the three with observed NAPL.
7. Page 36, section 4.3.3.1 Area B, second sentence. This sentence lists core NC022CSC as “adjacent” to NC271SC-A, when NC022CSC is actually mid-channel and NC271SC-A is adjacent to the bank. The text should be revised accordingly.
8. Page 37, Section 4.3.3.2 Area C, Second full paragraph. “is not associated with a more substantial area of NAPL impacts”. This conclusion should be revised to limit the characterization to apparently mobile (i.e., Category 2/3) NAPL. The number of cores with significant blebs, sheens, oil staining, etc. is extensive in this area.
9. Page 37, Section 4.3.3.3 Area E. This Section references Figure C4-9e and C4-10f, but the former only goes to Creek Mile 2.38 and the latter starts at 2.38 and goes to 2.48. Reference Figure C4-9f for a sufficient plan view.
10. Page 39, definition of lateral limits of Category 2/3 areas. These are acceptable for initial bracketing, but items in the first two bullets will likely require further evaluation to confirm the extent of potentially discontinuous NAPL. Some statement to that effect is warranted in the text.
11. Page 41, Section 4.4.1.2 Step 2 – Characterize the Extent of Category 2/3 NAPL Observations, first full paragraph. “the sand layer associated with the Category 2/3 observations is discontinuous and limited in extent”. Note that all underlying native material is described as 75% coarse grained sediment and is therefore continuous. The top of native material could be the conduit to more discontinuous coarse grained strata at the base of the sediment column. The text needs to be revised to reflect these conditions.
12. Page 41, Section 4.4.1.2 Step 2 - Characterize the Extent of Category 2/3 NAPL Observations, paragraph describing Cross Section 1. “and upstream by NC056SC-A”. Note that this core is >500 feet upstream. Only one boring upstream of NC262SC-A was noted in the plans for FS sampling to provide additional bracketing of the Category 2/3 NAPL in this area.
13. Pages 41 and 42, Section 4.4.1.2 Step 2 - Characterize the Extent of Category 2/3 NAPL Observations. “Differences in observations in collocated cores indicate that the lateral extent of Category 2/3 NAPL in this area is limited.” This conclusion is questioned and should be evaluated during the FS sampling. Additional discussion to support the

conclusion should be provided in the text. It is possible that the area of Category 2/3 NAPL is somewhat widespread yet that distribution is discontinuous.

14. Page 45, Section 4.4.2.2 Step 2 - Characterize the Extent of Category 2/3 NAPL Observations, first paragraph. "GPEC-SB113 also provided a lateral limit of Category 2/3 observations in this area". This boring is very close to others with Category 2/3 observations and no delineation borings were proposed in this area in the FS field program. An additional delineation boring is needed to provide better definition of the extent of Category 2/3 NAPL.
15. Page 54, Section 5, last paragraph. "do not represent more substantial areas of NAPL impacts". See comment for Section 4.3.3.2 Page 37, final paragraph stating "is not associated with a more substantial area of NAPL impacts". This conclusion should be revised to limit the characterization to apparently mobile (i.e., Category 2/3) NAPL. The number of cores with significant blebs, sheens, oil staining, etc. is extensive in this area of multiple oil terminals.
16. Section 5, Page 55, second paragraph: "This dataset is sufficient for completing the RI because the NAPL was observed deep in the native material (greater than 10 to 50-plus feet below the mudline)." This sentence should not start a new paragraph because it is intrinsically linked to the description of vertical characterization of NAPL in the preceding paragraph, and it needs to be qualified regarding why the data set could be considered sufficient for the RI. It would also be important to note in the text that the deep impacts noted here could be a potential continuing source of groundwater contamination.

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# Section 5 Sources

## **General Comment**

1. Any conclusions drawn from the NCG's interpretation of the hydrodynamic and sediment transport models developed for the Newtown Creek site will be revisited following USEPA's review of these draft model codes and their inputs, interaction, and outputs. USEPA's comments on the models submitted with the RI Report will be provided separately.

## **Specific Comments**

1. Page 185, Section 5.1 Point Sources and Overland Flow, second paragraph, first sentence. The description of the types of point source to Newtown Creek is incomplete and does not include all of the types of point discharges described in Sections 5.1.1.1, 5.1.1.2, and 5.1.1.3. The text should be revised to provide a more complete description of the range of point source discharges. For example, the description does not include individually permitted wastewater discharges or highway drains.
2. Figure 5-1. Add title, legend, scale, north arrow. NCB CSOs should be labeled with dashes (e.g., NCB-002 and NCQ-029).
3. Page 186, Section 5.1.1.2 Category 2 – Combined Sewer Overflows and WWTP Effluent Overflow, second bullet:
  - a. Delete the reference to Kwan 2014a in this section and all other sections of the RI Report. The actual source of the information to be cited is NYCDEP's Newtown Creek WWTP Wet Weather Operating Plan (WWOP), NYCDEP, Bureau of Wastewater Treatment, Capital Project No. WP-283, April 3013. The information on treated effluent discharges to Newtown Creek from NCB-002 is included in Table 2-1 of the NYCDEP WWOP
  - b. In several sentences in this section (and in other section of the RI Report) the discharge from the high-relief wastewater treatment plant (WWTP) outfall is called "effluent". The discharge should be characterized as "treated effluent"; this change should be made throughout the RI Report.
4. Page 189, Section 5.1.2.1 Sources of Flow Data:
  - a. First full sentence. The 2015 geo-neutral point source model was used to estimate CSO and stormwater flow (including overland flows) for loading estimates for the 5-year period from 2008 through 2012. Explain the rationale for the selection of the 2008 through 2012 5-year period.
  - b. First full paragraph: Section 4 of Appendix G is referenced as the source discharges not included in the geo-neutral point source model; a more specific reference is required. Section 4 of Appendix G is over 40 pages long and includes numerous tables and figures.

- c. Exxon Mobil Greenpoint Remediation Project. Estimated Annual discharge volume was estimated from 2012 (January 2012 through December 2012) Discharge Monitoring Reports (DMRs). Provide the rationale in the text for the use of 2012 data (and not another year or years) to represent annual discharge for EM001A and EM002.
5. Page 195, Section 5.1.3.2, first paragraph and Table 5-3 and Figure 5-5, point source POC data. Per USEPA e-mail of October 4, 2016, USEPA provided an approach for adjusting the point source POC data and performing sensitivity analysis to assess the impact of the adjusted data on modeling results. Explain in the text or a footnote to Table 5-3 and Figure 5-5, whether the POC data are the original, unadjusted data or the adjusted data. In addition, include the results of the sensitivity analysis and what impacts, if any, the use of the adjusted data had on the point source loading results.
6. Page 201, Section 5.1.4.1. There is no discussion as to why the fixed concentration loading method was selected. A buildup-washoff methodology with time-varying concentrations should be discussed in the main text, with justification of the principal reasons for selecting the fixed concentration method.
7. Page 209, Section 5.2.1 Groundwater Discharge, paragraph 2. This section describes the groundwater seepage study that was performed by the USGS to quantify groundwater seepage rates (positive and negative) to Newtown Creek. It states that the study “...measured the net discharge of water from surface sediment to surface water...” Loading of dissolved COPCs to the Study Area is based on the discharge rates measured by the USGS. Using the “net” seepage rate underestimates the actual COPC load discharging to the study area because it fails to account for the impact of tides on the seepage rates. At seepage meter location NC286, an average net flow of 0.0 cm/day was measured and used to develop Figure 5-19b. At this location, 0.0 kg of COPC is estimated to be discharged. However, actual seepage fluctuates between positive and negative 0.5 cm/day approximately twice per 24 hour period resulting in gross positive seepage greater than 0.0 cm/day. COPCs in the porewater discharge to surface water during intervals of positive seepage, up to 0.5 cm/day, not 0.0 cm/day. An analysis of COPC migration from surface sediment to surface water, using gross discharge, should be performed throughout the study area to evaluate whether COPC loading quantities are significantly different from existing estimates.
8. Page 210, Section 5.2.1.2 Groundwater for Segment Groups and Individual Segments, second paragraph, Table 5-15. The magnitude of negative seepage near the mouth of Newtown Creek is inconsistent with the geology in that area. Cross sections indicate the presence of rock or clay below the sediment, which would limit seepage rates even with a relatively high vertical gradient. This provides further evidence that the seepage meter results should be reinterpreted or seepage rates should be re-measured. The report should indicate that additional seepage data will be collected as part of the FS field program.
9. Page 210, Section 5.2.1.2, second paragraph, Page 210. The text should explain in more detail how the multiplier for shoreline type was selected.

10. Pages 213 and 214, Section 5.2.3, second paragraph bullets. Bullet No.1 concludes: “total net groundwater discharge is approximately zero or negative”, but this is heavily influenced by the significant negative value from the most downstream USGS seepage meter. Therefore, cite the need to repeat and enhance the spatial coverage of seepage metering, per USGS recommendations and consensus reached during modeling meetings in the Spring/Summer of 2016. Bullet No. 2 cites Section 6.4.1 and Appendix Table E-C-1 but should instead cite Section 4.9.1 for partitioning information as stated in Section 5.2.2. . USEPA may choose to revisit the groundwater discharge estimate after the additional seepage meter data is collected.
11. Page 215, Section 5.3.1 TPAH, second paragraph, fourth sentence. The text reads as follows: “Concentrations were slightly higher during some of the warmer months, with the highest (and most variable) concentrations measured occurring in August...”. Revise the text to include possible explanations for these highly variable and elevated concentrations associated with the mid-August sampling event.
12. Page 218, Section 5.3 East River, first paragraph. This paragraph states that copper concentrations in the East River are comparable to those found in Newtown Creek and references Figure 5-29. It should also include that concentrations in CM 2+ and Maspeth Creek are higher than other sampling locations.
13. Page 218, Section 5.4, East River, first paragraph: “Groundwater seeps” should be included with the list of factors that contribute to bank erosion.
14. Page 218, Section 5.4 Bank Erosion, first paragraph, second sentence. The text reads as follows: “Susceptibility to bank erosion increases when erodible soils are exposed to surface water currents, stormwater runoff, wind, and over-steepened bank conditions.” Revise the statement to read as follows: “Susceptibility to bank erosion increases when erodible soils are exposed to surface water currents, stormwater runoff, waves, vessel wakes, and over-steepened bank conditions.”
15. Page 219, Section 5.4.1 Bank Erosion Significance Rationale, second paragraph, first and second sentences. The text reads as follows: “For a bank erosion source pathway to be complete, data indicating contaminants are present in the bank soils must be available and bank erosion must exist in order to transport the contaminants to the creek. The presence of contaminants at adjacent upland sites generally has not yet been evaluated by NYSDEC or USEPA.” Add additional text describing the proposed sampling approach for evaluating the erodibility of riverbanks and characterizing riverbank materials. Furthermore, add text discussing the potential for groundwater migrating through contaminated bank materials to transport these contaminants to the waters of Newtown Creek.
16. Page 221, Section 5.4.2 Current Status of Bank Erosion Pathways, last paragraph, last sentence. The text reads as follows: “Sites with moderate, low, or incomplete bank erosion pathways are documented in Table E4-1 of the draft SSAM (Anchor QEA 2014n).” USEPA has indicated that data gaps exist in the RI regarding shoreline contaminant concentrations and distributions. This information may be pertinent during the evaluation of any shoreline

remedies that are conducted in conjunction with the in-water remedy. Bank erosion data gaps identified will be addressed during the FS field sampling program. This information should be stated in the RI Report.

17. Page 222, Section 5.5 Atmospheric Deposition, last paragraph. Atmospheric deposition loading estimates are compared to TPAH, TPCB, and copper point source loading estimates. For context and a more robust evaluation, compare atmospheric loading estimates for TPAH, TPCB, and copper to groundwater loading estimates for the same constituents.
18. Page 224, Section 5.7 Contaminant Seeps. During the 2016 Field Ebullition Study (FES), seeps were noted in some locations. Discuss within the text the seeps identified during the 2016 FES. In addition, others have observed seeps from the banks of Newtown Creek. Indicate in the text that seeps will be identified and sampled in the FS Field program and the data evaluated in the FS.

# Section 6 Fate and Transport

## **General Comments**

1. Any conclusions drawn from the NCG's interpretation of the hydrodynamic and sediment transport models developed for the Newtown Creek site will be revisited following USEPA's review of these draft model codes and their inputs, interaction, and outputs. Also, because of potential feedback to the RI Report based on the chemical fate and transport and bioaccumulation models, the RI Report may require additional revision after those models are completed.

## **Specific Comments**

1. Page 226, Section 6.1 Introduction, first paragraph. The mechanism of ebullition needs to be added to this paragraph and to Figure 6-1.
2. Page 228, Section 6.2.1 Freshwater Inflow, last paragraph. Resolve the inconsistency caused by this passage indicating that the estimated groundwater inflow is 1,100 million gallons per year (MGY); this conflicts with the statement in Section 5.2.3 indicating that the total net groundwater discharge is near zero or negative.
3. Page 229, Section 6.2.2 Current Velocities, Circulation, and Tidal Effects, first paragraph. The text states: "Typical of a dead-end tidal channel, current velocities have a maximum value near the mouth of Newtown Creek and decrease with increasing distance from the East River, with relatively stagnant conditions in the upper portions of the Study Area (e.g., East Branch and English Kills)." The term "stagnant" is qualitative and subject to interpretation. Revise the sentence as follows: "...and decrease with increasing distance from the East River, with the lowest current velocities occurring in the upper portions of the Study Area (e.g., East Branch and English Kills)."
4. Page 229, Section 6.2.2 Current Velocities, Circulation, and Tidal Effects; last sentence in each of the first and second paragraphs. Explain how the peak current velocities can be the same during dry and wet weather conditions.
5. Pages 230 to 233, Section 6.3, Sections 6.3.1 Sediment Bed Characteristics, and Section 6.3.4 Deposition and Net Sedimentation. The existing bathymetric data does not appear to indicate that the creek is either "filling-in" or experiencing net sedimentation rates of 0.5-7.0 cm over the past 10-25 years. Describe the lines of evidence used to develop sedimentation rates, the range of sedimentation rates provided by each line of evidence per site area, and how the individual lines of evidence were combined to arrive at the 0.5 to 7 cm/year deposition rate.
6. Page 231, Section 6.3.2 Sediment Source and Inputs, third paragraph, third sentence. "Point source sediment loads occur during episodic discharge events that typically last 2 to 6 hours, as evidenced by higher Round 1 TSS concentrations during wet weather sampling, as compared to Round 2 concentrations (see Section 4.7.2.3)." While Round 1 wet weather TSS concentrations tend to be lower than Round 2 wet weather TSS concentrations, it should be

noted and explained in the text that in the majority of creek reaches during both the Round 1 and Round 2, wet weather TSS concentrations are generally lower than dry weather TSS concentrations (Figure 4-87). This condition occurs in both the shallow and deep wet weather surface water samples and requires further discussion and explanation.

7. Page 232, Section 6.3.2 Sediment Sources and Inputs, first paragraph, first full sentence. It is stated that “Slumping and cracking when the intertidal sediment is exposed and dewatered during low tide may affect the stability of sediment in the accreted areas near certain CSO outfalls as well.” Has slumping of intertidal sediment been observed? If so, the observations should be described in the text.
8. Page 233, Section 6.3.4 Erosion, first paragraph. This paragraph describes erosion of the sediment bed through prop wash but fails to address the volume or mass of sediment that becomes resuspended and the resulting total load of COPCs that re-enter the water column. The section should be revised based on USEPA’s comments on the prop wash model.
9. Page 233, last sentence. Low current velocities alone are not sufficient evidence of a net depositional system. Further explanation is needed. Describe the lines of evidence used to develop sedimentation rates, the data quality of each sedimentation rate line of evidence, the range of sedimentation rates provided by each line of evidence per site area, and how the individual lines of evidence were combined to arrive at the 0.5 to 7 cm/year deposition rate
10. Page 235, Section 6.4.1 Chemical Partitioning Characteristics, second bullet. This statement emphasizes the need to have a full sediment transport model in the East River to be able to much more accurately calculate the exchange of particulate chemicals between these two tidal water bodies. Also, as stated in Section 6.4.2.2, “tidal exchange with the East River is the dominant mechanism controlling surface water chemical concentrations in the main stem of Newtown Creek and the lower tributaries under dry weather conditions”.
11. Section 6.4 Chemical Fate and Transport.
  - a. Pages 244 to 247. The narrative in this section needs to be clearer regarding whether the data and trends discussed are for the dissolved COPC fraction of surface water only or for whole water.
  - b. Page 245, first paragraph. As stated in the last sentence, the “influx of East River water strongly affects concentrations within most of the main stem and the lower tributaries”. Once again, this influx, which is effected by physical transport, and chemical and biological processes in the East River as well as by the efflux of chemicals from Newtown Creek, cannot be accurately modeled using the simplified sediment transport modeling approach (i.e., hard bottom, no sediment settling) being used in the East River.
  - c. Page 245, second paragraph. Explain how copper water column concentrations being relatively constant throughout the Study Area indicate that fluxes from surface sediment are less important than exchange with the East River.

- d. Page 246, last paragraph. This paragraph states that a potential dilution effect is exhibited by lower concentrations of TPCBs in English Kills while TPAH concentrations do not indicate that dilution is occurring. This must be resolved or explained in the text.
  - e. Page 247, second complete paragraph. This paragraph concludes that the East River is not impacted to the same degree as Newtown Creek during wet weather. It should also be considered that effects of the wet weather discharges occur in the East River after sampling was completed or that other wet weather discharges are diluted by the large volume of water in the East River.
12. Page 354, Section 6.4.4.2, first paragraph. The fourth and sixth sentences in this paragraph once again emphasize that the importance of accurately simulating the exchange of sediment between Newtown Creek and the East River. If the exchange of sediment is not being accurately simulated, then the exchange of adsorbed chemicals cannot be either.
13. Page 255, Section 6.4.4.3 Losses of Chemicals from the Surface Sediment. This section describes a process by which sediments are buried by cleaner solids settling out of the water column. Any locations where the rate of settling solids is not sufficiently high to overtake sorbing of contaminants from impacted groundwater or ebullition facilitated migration of COPCs should be identified.
14. Page 252, Section 6.4.3.2 Particulate Phase Sediment/Water Exchange, continuing paragraph. This paragraph states that COPC concentrations in Turning Basin sediment traps are significantly lower than surrounding surface sediment. The reason given is that cleaner solids from the East River and point sources settle in this reach. There are other potential causes for this condition including surface sediment contamination by the amount of ebullition facilitated NAPL migration that appears to occur in this area. This should be discussed in the text.
15. Page 263, section 6.4.5.3 Sorption and Desorption in the Subsurface Sediment, first continuing paragraph. This paragraph describes distribution of TPAHs between groundwater, porewater, and surface water and concludes that lower concentrations of TPAHs in the porewater are related to the sorption of the TPAHs to carbon-containing sediment. Data also show that salinity is often lower in the porewater than surface water which likely indicates a mixing zone that is present in the porewater. This is quite likely the case for the diluted TPAHs as well and reflects the tidal influence on seepage. For example, at EK093, seepage is 0.3 cm/day, salinity in surface water and porewater are similar and TPAH is lower in porewater than in groundwater. Discuss the potential for dilution of TPAHs in shallow porewater by tidal pumping.
16. Page 269, Section 6.4.7.2 Mobil NAPL Migration in Native Material/Subsurface Sediment, continuing paragraph. This paragraph states that NAPL is largely immobile. It is understood that under static conditions, the intent of the narrative is to indicate that the NAPL is not flowing or able to be recovered. However, it should also be stated that during anchoring, dredging, bulkhead repair, etc. NAPL could be mobilized and can migrate to the surface water. Also, it should be stated in the text that immobile NAPL is available for transport via groundwater advection and by ebullition.

17. Page 271, Section 6.4.7.5 NAPL Movement on Surface Water, third paragraph. Shoreline seepage of NAPL has been observed. Include this potential source in the list of potential sources of NAPL to surface water.
18. Page 272, footnote. It is unclear how the chemical fate and transport model will be able to accurately quantify the chemical fluxes discussed in this footnote due to the problems previously discussed with the simplified sediment transport model in the East River.
19. Page 273, Section 6.5.1, Methods and Results for Inventory and Load Estimates, first paragraph. The text should be revised to emphasize that although fate and transport focused calculations are being presented here that include consideration of fate and transport within the Study Area, the Chemical Fate and Transport modeling is being conducted as part of the Feasibility Study. Such modeling needs to be conducted with an approach that considers the results presented in the RI Report as preliminary and subject to change, pending FS stage field work results as well as updates that may be needed based on other FS activities.
20. Page 275, Section 6.5.1.3 Sediment/Water Interface Chemical Mass Exchange, first bullet. Include a more detailed description of the selection and use of the porewater exchange coefficient.
21. Pages 273 to 277, Section 6.5.2 Comparison of Mass Load and Inventory Estimates. Because of the large volume of COCs inventoried in the subsurface sediments, calculations of COC diffusion flux should be conducted and results should be described to eliminate concern related to this mechanism.
22. Page 280, Section 6.5.2.2 TPCB, last bullet. Add the CM2+ as a reach where sediment TPCB concentrations and per acre mass of PCBs are elevated. In fact, nearly all stretches of the creek have elevated concentrations of TPCBs relative to reference areas.
23. Page 281, first sentence. "Bioaccumulation is the process by which chemicals accumulate in biological tissues, increasing with each trophic level, potentially reaching higher concentrations..." Bioaccumulation is the process by which chemicals accumulate in tissues, but the process of increasing with each trophic level is biomagnification. The statement should be clarified.
24. Page 281, first paragraph, second sentence. "This section focuses on TPCB because the BHHRA and BERA identified PCBs as the primary chemical of concern via food ingestion, and because PCBs are bioaccumulative." The BHHRA shows that PCBs, dioxins, and pesticides (dieldrin and heptachlor epoxide) are the risk drivers, and all of them are bioaccumulative. The BERA shows that PAHs, PCBs, and copper are risk drivers, and all of them are bioaccumulative. The discussion in this section should be revised to include all contaminants found to drive human health and ecological risk in the Final BHHRA and Final BERA.
25. Page 281, second paragraph, third sentence. The text "(e.g., point sources, East River, and others)" should be revised to include "industrial activities, chemical spills, NAPL". As stated,

it appears that the potential sources for bioaccumulative chemicals exclude conditions and operations related to the site.

26. Page 281, third paragraph, fourth sentence. Delete “at EPA’s request”.
27. Page 282, Section 6.6.2.1 Resident Organisms, The possible home range of 380 meters cited for mummichog is only seen in systems with extensive contiguous tidal wetlands. In areas with restricted habitats, such as those in the study area, home ranges of mummichog are much closer to the lower values provided (30-40 meters). Revise the text accordingly.
28. Page 282: The discussion in this section should include all contaminants found to drive human health (PCBs, dioxins, dieldrin, and heptachlor epoxide) and ecological risk (PCBs and PAHs).
29. Page 282, first paragraph, first sentence. Delete “of PCBs”.
30. Page 282, third paragraph, first sentence. Delete “except for white perch”. There is no strong relationship between lipids and PCB for white perch ( $r^2=0.52$  does not represent a strong correlation here).
31. Page 283, footnote 98, first line. “biota-sediment accumulation factor” is included within the text twice; delete one occurrence.
32. Page 283, footnote 98, last sentence. Delete the last sentence: “This is particularly evident in the mobile species in Newtown Creek, whose home ranges are known to exceed the Study Area, as discussed in the next subsection.”
33. Page 284, first incomplete paragraph. Whenever discussing the  $r^2$  values for statistical relationships, both in the text and on the associated figures, include the p value to show significance. The p value is included in the text, but not on the associated figures.
34. Page 285, first paragraph, third sentence. Delete: “...these species are exposed to contaminants outside the Study Area...” Unless NCG has data to show that the fish tissue collected for this RI was contaminated by PCBs from other locations, the inclusion of such a statement biases the discussion.
35. Page 285, second paragraph, second sentence. “...additional sources of exposure must be considered.” Given the concentrations of contaminants in Newtown Creek sediment, it is likely that the vast majority of a striped bass life cycle would be spent in areas with less contamination. To state that additional sources of PCBs added to the fish tissue burden is biased. It is possible that Newtown Creek is the most contaminated area the collected fish had ever visited. Any discussion of adding tissue body burden from outside the Study Area must also emphasize that migratory fish may dilute their body burden by foraging in non-contaminated areas.

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# Section 7 Risk Assessment Summary

## **General Comments**

1. The BHHRA has not been finalized. Revisions to this section may be necessary upon completion of revisions to the BHHRA, and acceptance by USEPA.
2. The BERA has not been finalized. Revisions to this section may be necessary upon completion of revisions to the BERA, and acceptance by USEPA.

## **Specific Comments**

1. Page 287, Section 7 Risk Assessment Summary, paragraph 1. Change “exposure to hazardous substances” to “exposure to CERCLA hazardous substances” in the first sentence.
2. Page 287, Section 7.1 Human Health Risk, paragraph 1. Change “exposures to hazardous substance releases in the Study Area” to “exposures to CERCLA hazardous substances present in the Study Area” in the first sentence.
3. Page 287, Section 7.1. Human Health Risk, paragraph 1. Change “data used in the BHHRA are comprehensive, consisting of...” to “data used in the BHHRA consist of...”. The set of sediment data used for most receptors in the BHHRA was more focused than comprehensive (i.e., only 5 to 15 of the 399 samples were used to evaluate all scenarios except flooding).
4. Page 287, Section 7.1 Human Health Risk, paragraph 2. The summary should give an indication of the magnitude of estimated risks and not just state that risks were above certain thresholds. Change the first sentence of this paragraph to the following (*italics used here to indicate the added text*): “The BHHRA concludes that the only recreational receptor categories and exposure pathways with estimated cancer risks above the USEPA acceptable cancer risk range (i.e., up to  $8 \times 10^{-4}$ ) and noncancer hazard index (HI) greater than the threshold of 1 (i.e., up to 40) result from the consumption of fish and crab tissue by recreational anglers and crabbers.”
5. Page 288, Section 7.1 Human Health Risk, first complete paragraph on page 288. Change the last sentence from “For the general construction worker, no individual COPCs exceed the HI threshold of 1” to “For the general construction worker, the HIs were less than 1 for all target organs except the CNS. The HI for potential CNS effects was just over 1 primarily due to PCBs in sediment.”
6. Page 290, Section 7.1.2 Exposure Assessment, paragraph 2. In the third sentence, change “recreational activities in Newtown Creek” to “recreational activities along much of the shoreline of Newtown Creek.”
7. Page 290, Section 7.1.2 Exposure Assessment, paragraph 2. Remove the last two sentences of the paragraph starting with “Furthermore, the NYSDOH has issued sportfish health advisories...”. As noted in the comments on the December 2015 BHHRA report, sportfish

advisories are an exposure control, intended to limit public exposure to chemical contamination in fish or shellfish that may occur because of contaminated areas like the site itself, while that contamination persists. However, a BHHRA is supposed to estimate the current and future baseline risks posed by a site in the absence of exposure controls. Consistent with revisions to the BHHRA, discussion of potential impacts of sportfish advisories on risks must be limited to the uncertainty analysis (summarized in Section 7.1.6 of the RI). In addition, any such discussion must note that the reasonable maximum exposure (RME) for angler/crabber is not assumed to be aware of, or adhere to, sportfish advisories and that such advisories are not within the purview of USEPA (i.e., advisories may influence current fishing/crabbing behavior for a portion of the population, but may not exist in the future to influence future fishing/crabbing behavior). Note that if the sportfish advisory text is moved to Section 7.1.6, it must be revised to accurately summarize those advisories: NYSDOH has not set an advisory for dioxins in fish in these waters.

8. Pages 291 to 292, Section 7.1.2 Exposure Assessment. The phrase “as directed by USEPA” is used excessively (e.g., seven times in these two pages). Given that USEPA has directed the NCG to complete the entire RI/FS, all the information within the document could be considered to be EPA-directed. In addition, if intended to convey NCG disagreement with a specific approach, that is already documented in the record and the use of the phrase in this summary is too vague to indicate the point of objection and is potentially misleading (e.g., a complete exposure pathway could be evaluated either qualitatively or quantitatively in the BHHRA; saying that a qualitative evaluation was “directed” implies that the NCG would have preferred a quantitative evaluation, which is not the case). Unless it is documented that USEPA provided specific direction on a specific item or topic, delete “as directed by USEPA” from the document.
9. Page 292, Section 7.1.2 Exposure Assessment, flooding scenario bullet. Inhalation of ambient air during flooding is not assumed to have “low exposure potential.” Revise the second sentence in this bullet to: “Inhalation of ambient air during flooding would also occur and was evaluated qualitatively due to the uncertainty in estimating air concentrations related to flooding events.”
10. Page 292, Section 7.1.2 Exposure Assessment, paragraph below bullets. Remove the third (final) sentence of this paragraph. The purpose of a CSM figure in the BHHRA is not “to memorialize the pathways that were agreed upon by the NCG and USEPA” but to summarize potentially complete exposure pathways associated with the site and how they are evaluated in the BHHRA. Change the third sentence to: “The CSM is used to identify potentially complete and incomplete exposure pathways and, for potentially complete exposure pathways, whether the pathways are to be evaluated qualitatively or quantitatively in the BHHRA.”
11. Page 295, Section 7.1.3 Toxicity Assessment, first full paragraph, third sentence. Since both chronic and sub-chronic exposures are evaluated in the BHHRA, change the end of the sentence from “during a lifetime” to “during a lifetime for chronic RfDs or during a portion of a lifetime (i.e., less than one year) for sub-chronic RfDs.”

12. Page 296, Section 7.1.4 Risk Characterization, second paragraph. The text regarding HQs and HIs has some repetition and should be revised for clarity and accuracy. Revise the second half of the paragraph, starting with "Consistent with USEPA guidance..." as follows:  
"HQs for individual COPCs and exposure routes are then summed to calculate an HI. However, summing the HQs for COPCs that differ in target organ and/or mechanism of action could overestimate the potential for adverse health effects. Therefore, consistent with USEPA guidance (USEPA 1989), if an HI for an exposure pathway is greater than unity, target organ-specific HIs are calculated to indicate the potential for noncancer hazards from simultaneous exposure to several COPCs. The conclusions of this analysis are included in the risk characterization summaries that are provided later in this section."
13. Page 296, Section 7.1.4 Risk Characterization, third paragraph. Revise the first sentence to:  
"The conclusion of the BHHRA risk characterization is that the only unacceptable human health cancer risks or noncancer hazards were associated with recreational fishing and crabbing consumption and general construction work."
14. Pages 297 through 300, Section 7.1.4 Risk Characterization. Text, and not just tables, in the risk characterization section should give some indication of the magnitude of estimated risks/hazards that exceed thresholds. It is not adequate to just state that risks or hazards exceeded thresholds.
  - a. Page 297, paragraph after bullets, second sentence. Add to the end of the sentence "(i.e., cancer risks up to  $8 \times 10^{-4}$  and noncancer HIs up to 40)."
  - b. Page 297, paragraph after bullets, third sentence. Insert "(i.e., HI = 2)" after "noncancer HI threshold of 1"
  - c. Page 299, third paragraph, third sentence. Revise the sentence to: "For the recreational angler/crabber, the estimated CTE cancer risks for all age classes and tissue types are within USEPA's acceptable risk range of  $1 \times 10^{-6}$  to  $1 \times 10^{-4}$ , and the estimated CTE noncancer HIs are above the threshold of 1 (i.e., HIs ranging from 2 to 5)."
15. Pages 298 and 299, Section 7.1.4 Risk Characterization. Remove sentences comparing cancer risks for individual COPCs to the USEPA acceptable risk range; cancer risks are assumed to be additive and the total risk should be compared to the USEPA risk range. When the total risk exceeds the risk range, identify the primary COPCs contributing to that risk, regardless of whether the COPC-specific risks individually exceed the risk range.
16. Pages 298 and 299, Section 7.1.4 Risk Characterization. Similar to the previous comment, remove sentences comparing HQs for individual COPCs to the threshold of 1. In cases where target organ-specific hazard indices (HIs) exceed the threshold of 1, identify the primary COPCs contributing to the HIs, regardless of whether the COPC-specific HQs individually exceed the threshold.
17. Page 302, Section 7.1.6 Uncertainty Analysis, third paragraph, second sentence. The fish and crab consumption rates used in the BHHRA do reflect some of the conditions relevant to the Study Area. In the second sentence of this paragraph, delete the phrase "do not consider the

site-specific Study Area conditions” and replace it with “do not account for all the site-specific Study Area conditions.”

18. Page 302, Section 7.1.6 Uncertainty Analysis, third paragraph. Insert after the third sentence: “NYSDOH sportfish advisories are an exposure control, intended to limit public exposure to chemical contamination in fish or shellfish that may occur because of contaminated areas like the site itself, while that contamination persists. A BHHRA is supposed to estimate the current and future baseline risks posed by a site in the absence of exposure controls, so the RME angler/crabber was not assumed to be aware of/adhere to sportfish advisories. However, the portion of the angling population that does adhere to sportfish advisories will have a much lower consumption rate than was assumed in the BHHRA.”
19. Pages 302 to 303, Section 7.1.6 Uncertainty Analysis. The scenario labeled “FI=0.5” does not match USEPA Region 2’s use of Fraction Ingested, which apportions consumption from areas within a site. Consistent with revisions to be made to the BHHRA, the alternative scenario termed “FI=0.5” should be relabeled to “broader recreational angler” to reflect that the ingestion rate is being halved to account for fish that may be caught in locations outside the site.
20. Page 303, Section 7.1.6 Uncertainty Analysis, first and second paragraphs. Consistent with revisions to be made to the BHHRA, the alternative scenarios assuming compliance with sportfish advisories or only 50% of consumed fish or crab coming from the Study Area do not reflect reasonable maximum exposures. Remove any reference to “RME” when characterizing these scenarios.
21. Page 303, Section 7.1.6 Uncertainty Analysis, third paragraph, first sentence. Change “risk management” to “risk assessment”.
22. Pages 303 to 304, Section 7.1.6 Uncertainty Analysis, first paragraph. Remove the sentence beginning “An underestimation of all human health risks associated with exposure to non-CERCLA...” Non-CERCLA substances are not a part of a CERCLA risk evaluation, which was already noted in the previous sentence.
23. Pages 304 to 305, Section 7.1.7 BHHRA Conclusions 7.1.7.1 Study Area. The summary should give an indication of the magnitude of estimated risks and not just state that risks were above certain thresholds.
  - a. First bullet, regarding anglers/crabbers. Add “(i.e., up to  $8 \times 10^{-4}$ )” to the end of the first sentence. Add “(i.e., up to HI=40)” to the end of the second sentence.
  - b. Second bullet, regarding general construction worker: Add “(i.e., HI=2)” to the end of the first sentence.
  - c. Fourth bullet, regarding CTE scenario: Add “(i.e., up to HI=5)” to the end of the first sentence.

24. Page 305, Section 7.1.7 BHHRA Conclusions 7.1.7.1 Study Area, third bullet. Key COPC contributors to elevated total risk and noncancer hazard estimates should be identified even if the risk or HQ for the individual COPC alone does not exceed the threshold. The bullet does identify the key COPCs, but wording of the bullet must be revised to reflect this fact. Change this bullet to “For the RME recreational consumption of fish and crab exposure scenarios for the Study Area, the primary contributors to both cancer risks and noncancer hazards are PCBs and dioxins/furans (i.e., total nondioxin-like PCB congeners, total PCB congener TEQ, and total dioxin/furan TEQ). For the RME general construction worker, the primary contributor to noncancer hazard is total nondioxin-like PCBs congeners.”
25. Page 305, Section 7.1.7 BHHRA Conclusions 7.1.7.2 Phase 2 Reference Areas, first bullet. The summary should give an indication of the magnitude of estimated risks and not just state that risks were at the upper end of or above certain thresholds. Revise this bullet to: “RME cancer risks associated with the Phase 2 reference area fish and crab consumption are at the upper end of USEPA’s acceptable risk range for striped bass (i.e., up to  $1 \times 10^{-4}$ ), and exceed USEPA’s acceptable risk range for white perch and blue crab (i.e., up to  $2 \times 10^{-4}$ ). RME noncancer HIs for the reference areas exceed the threshold of 1 (i.e., up to HI=10).”
26. Page 305, Section 7.1.7 BHHRA Conclusions 7.1.7.2 Phase 2 Reference Areas, second bullet. Change “and COPCs in the species” to “and a portion of the COPCs in the species”
27. Page 306, Section 7.1.7 BHHRA Conclusions 7.1.7.2 Phase 2 Reference Areas, first bullet on page. Consistent with previous comments regarding comparison of individual COPC risks or hazards to thresholds, revise this bullet as follows: “For the RME recreational consumption of fish and crab from the Phase 2 reference areas, the primary contributors to both cancer risks and noncancer hazards are PCBs and dioxins/furans (i.e., total non-dioxin-like PCB congeners, total PCB congener TEQ, and total dioxin/furan TEQ).”
28. Page 307, Section 7.2.1 Receptors and Exposure Pathways Evaluated, first complete paragraph. The text states that the most common crab is the blue crab, followed by the horseshoe crab. There were numerous small intertidal crabs (e.g., rock crabs) that were not included in the biota surveys. The surveys also did not enumerate the invertebrates (e.g., starfish, snails, bivalves) inhabiting the bulkheads and rocks. This section needs a statement that the biota surveys were not exhaustive, and that a significant number of fish and invertebrate species were potentially not accounted for due to the design and performance of the biota surveys.
29. Page 307, Section 7.2.1 Receptors and Exposure Pathways Evaluated, third paragraph, third sentence. “The lack of aquatic macrophyte community is likely due to the physical attributes of the Study Area and the characteristics of the substrate.” This statement ignores the elevated sediment concentrations of chemical contamination due to industrial activity, spills, releases, and NAPL. It is likely that macrophytes would be present in the absence of contamination. The statement is incomplete, and should either be deleted or the passage should be revised to include impacts on the aquatic macrophyte community due to physical attributes of the Study Area and due to years of chemical discharges and releases of contaminants.

30. Page 311, Section 7.2.4 Baseline Risk Analysis, second sentence. "...to further focus the BERA on those contaminants that are likely the most important contributors to ecological risk." The BERA cannot ignore contaminants simply because they are not among the most important contributors to risk. While addressing the primary risk drivers may cover most of the site, there may also be portions of the site in which secondary risk drivers pose risk. The text should be modified.
31. Page 311, Section 7.2.4.1 Aquatic Life, fourth sentence: "The use of Study Area-wide 95% UCLs is justified given that, in general, there are no areas with elevated concentrations that warrant examination on a smaller spatial scale." This sentence is misleading. The areas in the Turning Basin, East Branch, English Kills, and Dutch Kills have significantly higher concentrations of PAHs and PCBs in surface sediment. In fact, 19 of the 20 highest surface sediment concentrations of PAHs (ranging from 128 mg/kg to 784 mg/kg) are found in the downstream portion (greater than a half mile from the CSO) of English Kills, the downstream portion of East Branch, and in the Turning Basin. The use of Study Area-wide 95% UCLs serves to dilute the COPEC concentrations utilized in exposure modeling, by including the lower COPEC concentrations from the main stem of Newtown Creek, and the reach between the East River and Dutch Kills. The use of Study Area-wide 95% UCLs is not justified, and additional spatial breakdown (e.g., Turning Basin, East Branch, English Kills, Dutch Kills, Whale Creek, Newtown Creek from the East River to Dutch Kills, and Newtown Creek from Dutch Kills to the Turning Basin) would be more representative of the exposure to site contaminants.
32. Page 315, Section 7.2.4.2 Benthic Macroinvertebrates, first and second complete paragraphs. Delete these paragraphs. . The paragraphs effectively state that mineral oil is responsible for the stress to the benthic community, yet offers no proof. The discussion of confounding factors, mineral oil, and aliphatic hydrocarbons was initially part of the formal dispute submitted by NCG on December 22, 2016. However, this issue was resolved through technical discussion. The resolution included that the BERA is to be revised to include a more robust discussion to characterize the confounding factors. Until such revised text is included in the final BERA and accepted by the USEPA, the discussion should not be included in the RI.
33. Page 316, Section 7.2.4.2 Benthic Macroinvertebrates, first paragraph. The discussion lists sediment sample locations "adjacent" to the largest CSOs, and states that the highest C19-C36 concentrations are responsible for observed toxicity. In English Kills, two of the four listed locations, EK059 and EK065, are a half mile or more from the CSO, and listed location EK059 had 154.6 mg/kg PAHs, yielding a PAH TU=149. In East Branch, one of the two listed locations, EB006, is not adjacent to the CSO. In Maspeth Creek, the three locations are all closer to sediment locations with some of the highest measured PAH concentrations than they are to the CSOs. In all of the tributaries, the few locations mentioned in this paragraph are surrounded by sample locations with PAH concentrations high enough to cause the observed toxicity. While Figure 7-5 does indicate that C19-C36 concentrations correspond to observed toxicity, it does not support the assertion that toxicity is CSO-related. The paragraph should be revised to remove the biased statements emphasizing that CSOs are responsible for benthic impacts. Also see comment no. 32.

34. Page 316, Section 7.2.4.2 Benthic Macroinvertebrates, second paragraph. The concentration-response models in the BERA were not acceptable. The BERA attributes “error rates” to samples that do not correspond to the model predictions based on PAH toxic units and SEM metals toxic units which essentially ignored all other contaminants present at elevated concentrations in the sediment. This paragraph should be deleted.
35. Page 317-318, Section 7.2.4.4 Wildlife. Cormorant site use was modified to reflect foraging outside the Study Area and seasonal migrations. Cormorants are present in the Study Area year-round, and the exposure modification factor should be 1. The April 11, 2017 Newtown Creek Final Dispute Resolution Memo states that a range of exposure modifying factors should be used for all receptors. This section should be revised.
36. Page 318, Section 7.2.4.5.1 Fish and Crab Surveys, second paragraph, first sentence. “Fish and crab were collected from six zones...”. In Section 7.2.4.1 Aquatic Life, the 4th sentence states “The use of Study Area-wide 95% UCLs is justified given that, in general, there are no areas with elevated concentrations that warrant examination on a smaller spatial scale.” Add an explanation why the biota populations were treated on a smaller spatial scale than the COPECs.
37. Page 320, Section 7.2.4.5.2 Wildlife Surveys, first full paragraph, eighth sentence. For the purposes of the BERA, the exposure modification factor for the cormorant should be 1. Therefore, delete reference to the cormorant spending time in the East River. See comment no. 5.
38. Page 312, Section 7.2.4.5.2 Wildlife Surveys, fifth bullet. As discussed in Section 7.2.1, stating that the lack of aquatic macrophyte community is due to the physical attributes of the Study Area ignores the elevated sediment concentrations of chemical contamination due to industrial activity, spills, releases, and NAPL. It is likely that macrophytes would be present in the absence of contamination. The statement is incomplete, and should either be deleted or the passage should be revised to include impacts on the aquatic macrophyte community due to physical attributes of the Study Area and due to years of chemical discharges and releases of contaminants.
39. Page 322, Section 7.2.5 Uncertainty Analysis, General Uncertainty Comment. At multiple places in this section it says that something could result in an overestimation or underestimation of risk. The third option is that the risk estimation is appropriate. Modify these statements to say the effects of uncertainty are unknown.
40. Page 322, Section 7.2.5 Uncertainty Analysis, third paragraph, third sentence. The statement that use of 95% UCL tissue concentrations will overestimate risk should be revised to state that the risks may be overestimated or underestimated. Because the 95% UCL was based on a small number of tissue samples, the uncertainty is unknown. It is just as likely to underestimate risk as overestimate risk.
41. Page 322, Section 7.2.5 Uncertainty Analysis, third paragraph. Delete the last two sentences. The sentence immediately preceding them says that the uncertainty is unknown, but then the last two sentences say risk is overestimated.

42. Page 323, Section 7.2.5 Uncertainty Analysis, first paragraph, fourth sentence. Delete this sentence. The use of larger menhaden did not necessarily overestimate risk. Cormorants can and do eat larger fish, while other piscivorous bird species (which are represented by the kingfisher and cormorant) will eat larger fish and will eat large dead fish.
43. Page 323, Section 7.2.5 Uncertainty Analysis, second paragraph. Delete this paragraph. The second sentence says some of the SLs were inappropriate because they were based on protecting the food chain, or were freshwater based, or more recent toxicity data are available. The screening levels in the hierarchy are acceptable screening levels, based on sound science. The third sentence in this paragraph says the SLs could result in over- or underestimate of risk. Again, the third option is that the risk estimation is appropriate. The fourth sentence says that SLs for some COPECs are conservative and will overestimate risk, although the statement is not supported.
44. Page 323, Section 7.2.5 Uncertainty Analysis, third paragraph. This paragraph contradicts the preceding paragraph. The second paragraph faults SLs for not being generated for the species in question, or for fresh versus salt water. The third paragraph says that it is appropriate to use SLs derived from a suitable combination of studies and species, and gives a justification that could just as easily be used in paragraph 2.
45. Page 323, Section 7.2.5 Uncertainty Analysis, fourth paragraph, first sentence, on to page 324. Delete this sentence. The 10-day sediment test is a standard toxicity test that has been used successfully for many years. Additionally, the 10-day sediment test passed all acceptability criteria; the lab controls and reference area samples were also static exposures with no food, and yet they were acceptable. The toxicity observed in the Study Area samples was due to site-related COPECs. . The April 11, 2017 Final Dispute Resolution Memo states that the 10-day sediment toxicity study should be included in the BERA and given the same weight as the 20-day study.
46. Page 324, Section 7.2.5 Uncertainty Analysis, first incomplete paragraph, last sentence. The comparison only includes porewater COPECs, while comparison to bulk sediment COPECs may explain some of the observed results which are called confounded and uncertain. Revise the text to include bulk sediment comparisons.
47. Page 324, Section 7.2.5 Uncertainty Analysis, first complete paragraph, seventh sentence. Delete this sentence. Using LOAELs to derive TRVs does not overestimate risks. The use of NOAELs to derive TRVs would open an argument regarding overestimation of risks, but LOAELs could just as easily underestimate risk as overestimate risk.
48. Page 324, Section 7.2.5 Uncertainty Analysis, first complete paragraph, last sentence. The sentence needs clarification; it is unclear how the use of multiple lines of evidence to evaluate COPECs could result in the conclusion that they are less likely to contribute to risk? Multiple lines of evidence are used to develop a weight of evidence approach that can either strengthen the confidence that a COPEC poses risk or strengthen the confidence that it does not pose risk.
49. Page 324, Section 7.2.5 Uncertainty Analysis, second complete paragraph. This section discusses the 3Ps (pharmaceuticals, personal care products, and pathogens). These

constituents were excluded from evaluation in the Human Health and Ecological Risk assessments and should also be excluded from evaluation in the RI Report.

50. Pages 324-326, Section 7.2.6 BERA Conclusions, General Comment. The draft BERA has not yet been finalized. The conclusions of the BERA may be revised based on USEPA's comments. The BERA section of this RI will also require revision after the BERA is finalized.
51. Page 326, Section 7.2.6 BERA Conclusions, last paragraph. The Conclusions section closes with a discussion about non-CERCLA stressors. Physical habitat and salinity are the "dominant" stressors controlling birds, fish, and crabs. However, the discussion should include a statement that in the absence of sediment contamination, it is likely that the populations of birds, fish, and crabs would be both higher and more diverse.

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# Section 8 Conceptual Site Model

## Specific Comments

1. Page 327, Section 8.1, bulleted list of conceptual site model (CSM) elements, third bullet. The text should note that the fate and transport characteristics include both chemical-specific (e.g., solubility and adsorption) and site-specific fate and transport characteristics (e.g., hydrodynamics).
2. Page 327, Section 8.1, second paragraph. The CSM should distinguish between point source and non-point source discharges (presumably overland flow). Non-point sources are important from a regulatory perspective since they are not permitted. Non-point sources should be depicted on Figure 8-1.
3. Page 327, Section 8.1, third paragraph. The risk threshold should be  $1 \times 10^{-6}$  since this is the “point of departure” under Superfund and is used to establish preliminary remediation goals (PRGs) (Risk Assessment Guidance for Superfund: Volume I – Human Health Evaluation Manual, Part B, Development of Risk-Based Preliminary Remediation Goals, EPA/540/R-92/003. Publication 9285.7-01B. December 1991). In addition, this section should note that recreational anglers and crabbers are potentially exposed to COPCs through fish and shellfish consumption to distinguish between other routes of exposure such as direct contact with sediment while fishing or crabbing.
4. Page 328, Section 8.1, first partial paragraph. The CSM should describe any potential risks to piscivorous birds and mammals evaluated in the BERA.
5. Page 328, Section 8.1, first full paragraph. The text should describe the results of any evaluation that has been conducted to distinguish between risks associated with CSO and MS4 discharges and risks associated with industrial discharges and COPCs in sediment or this discussion should be deleted. The text should further state that the mixing of these discharges with hazardous substances within the sediment bed makes this contamination potentially actionable under CERCLA. Finally, the recontamination potential associated with CSO and MS4 discharges must be considered during the development of a remedial strategy for the site. As a result, the CSM should describe the impact of CSO and MS4 discharges on natural recovery processes within Newtown Creek.
6. Page 329, Section 8.2, first partial paragraph. USEPA acknowledges the designation of Newtown Creek as a significant maritime and industrial area (SMIA). However, the CSM should discuss the potential for changes in land use associated with a transition from industrial uses to high density housing and commercial uses in the vicinity of Newtown Creek. Overall, the CSM should describe both current and reasonably anticipated future land and waterway use.
7. Page 331, Section 8.3, second full paragraph. The report states that several lines of evidence demonstrate the net depositional nature of Newtown Creek. However, the CSM should also discuss the potential for maintenance dredging and other anthropogenic activities to re-

expose buried sediments. As noted in Section 3.2.4, navigation dredging took place within the lower reaches of Newtown Creek as recently as 2014.

8. Pages 334 and 335, Section 8.4.1.2 NAPL. The discussion of NAPL should describe in greater detail the widespread presence of NAPL in sediment at the Newtown Creek site and discuss the implications for ongoing releases of NAPL to the water body on natural recovery processes and the contribution of NAPL to risks to human health and the environment at the site.
9. Page 337, Section 8.4.3 Surface Water
  - a. Entire page. The discussion of surface water in the various reaches should include a discussion of the suspended particle concentrations during wet weather and dry weather flow conditions. The transport of suspended sediment particles within Newtown Creek is likely an important contaminant transport mechanism. As a result, the implications of changes in suspended sediment particle concentrations in the various reaches and flow conditions on contaminant transport within Newtown Creek should be presented and evaluated in the RI Report.
  - b. Second and third bullets. There are significant details important for understanding the processes by which surface water is impacted that are omitted. Since this section is explaining the Study Area CSM, the following processes, with short summaries, should be included to help the reader understand, fully, why surface water is contaminated:
    - i. Tidal pumping effects on porewater to that cause contaminant transport from contaminated subsurface and surface sediment with each tide
    - ii. Ebullition-facilitated migration of NAPL that causes NAPL to be mobilized to surface water
    - iii. Upland seeps of NAPLs to surface water
    - iv. Erosion and discharge of soils and fill material to surface water
10. Page 340, Section 8.5.1, Historical Sources. For the primary contaminants evaluated in the RI Report, USEPA comments on Section 3 regarding identification of historical sources and associated contaminants should be carried through to the CSM. Potential upland sources or activities that contributed to the presence of those contaminants in the Study Area should be identified (i.e. copper refining for copper; petroleum refining for PAH, etc.).
11. Page 340, Section 8.5.2 Current Sources, bulleted list. The list of current sources is limited to external sources such as point source discharges, groundwater discharges, and river bank erosion. However, contaminated sediments within the sediment bed of Newtown Creek represent internal sources of contamination to the system. These internal sources can be taken up by biota or released to the water column during high flow events, reworking of the sediment bed or through advective groundwater transport and, as a result, inhibit natural recovery within the Newtown Creek system. The CSM should identify internal sources as a current source of contamination and discuss the impact of internal sources on contaminant transport within Newtown Creek.

12. Page 341, Section 8.5.2.1. Section 5.1 discusses the lack of flow data used to develop the mass loading estimates presented in Figures 8-13, 8-14 and 8-15. Section 8.5.2.1 should include a discussion of the uncertainty in the loading estimates and the impact of that uncertainty on the CSM. In addition, Figures 8-13, 8-14 and 8-15 should include loading estimate ranges that reflect the uncertainty of the loading estimate rather than single values. To improve clarity separate Figures 8-13, 8-14 and 8-15 into separate figures depicting loading terms (e.g., point source or atmospheric deposition loads) and figures depicting contaminant mass in the various media (e.g., surface water and surface sediment). Also, propwash is mentioned in the figures, but is not quantified.
13. Page 342, Section 8.5.2.2, second paragraph. The report states that the East River “contains nearly the full suite of urban chemical contamination associated with the NY/NJ Harbor urban estuary.” This statement requires clarification and supporting documentation. What is the urban contamination that is being referred to, what is the concentration of this contamination in suspended sediments and what are the implications of this contamination on remedial strategies for the site? Further discussion of East River contaminant loading to the Newtown Creek site and the implications of such should be included in this section.
14. Page 342, Section 8.5.2.3, last paragraph. The CSM should distinguish between contaminated groundwater discharges and the transport of subsurface and surface sediment contamination to surface sediment and surface water via advection as depicted in Figures 8-13, 8-14 and 8-15. This is important from the standpoint of developing remedial strategies since hydraulic containment and control systems may be used to limit the discharge of contaminated groundwater discharges to the Newtown Creek site while sediment based remedies will be required to address advective contaminant transport.
15. Page 344, Section 8.5.2.3, first bullet item. The Report states that groundwater loads of TPAH, TPCB, and copper to the subsurface sediment of CM 0 – 2 are minor compared with the rest of the Study Area. While this is true for TPAH and TPCB, it is not true for copper. As noted in the last bullet, groundwater loads of copper are relatively uniform throughout the site (4.2, 6.6, and 5.7 kg/year for the three reaches of the Newtown Creek Site). The text correctly notes that the tributaries provide the majority of the TPCB groundwater load and that CM2+ provides the majority of the TPAH groundwater load.
16. Page 344, Section 8.5.2.4 Other Sources:
  - a. First paragraph. The discussion of contaminant loads should distinguish between site-wide and reach-specific or localized loading. For example, while erosion of contaminated riverbanks may be a minor source of contamination to the Newtown Creek site, localized contamination that poses a risk to human health or the environment may result from these discharges.
  - b. First bullet. Regarding the Frito Lay site, information should be updated to state that portions of the bulkhead are disintegrating and that water and soil can easily flow through the bulkhead.
  - c. Second bullet. The information here should be revised to address seeps and to indicate the contribution of COPCs to the Study Area will be assessed in the FS Field Program.

- d. Bullets. Add a bullet stating that additional evaluation of seeps and erosion may be significant and are being evaluated in the FS Field Program.
17. Page 345, Section 8.6.1, first paragraph. The report states that the two primary exposure pathways are exposure to bioavailable contaminants in surface sediment and surface sediment porewater, and exposure to contaminants in the water column. This eliminates a critical exposure pathway for the majority of contaminated sediment sites: the consumption of contaminated fish and shellfish by anglers and wildlife. The discussion of fate and transport processes should describe bioaccumulation and biomagnification within the food web.
  18. Page 345, Section 8.6.1 Contaminant Fate and Transport Processes, (Sources to the water column) and page 346 (Fate and transport within the water column). The discussion presented in these two subsections should include estimates of surface water loading (dissolved and particulate) within the various reaches of Newtown Creek during a range of flow regimes to help understand changes in contaminant load within the system and where contamination may be entering the water column or depositing onto the sediment bed. This may be useful from the standpoint of identifying ongoing sources of contamination within the Newtown Creek Study Area.
  19. Page 347, Section 8.6.1, paragraph following bulleted list. The report notes that the sediment bed is stable and that exposure of the food web to subsurface sediment is likely minimal and that the potential impacts of propwash will be further evaluated as part of future refinements to the sediment transport modeling. The CSM should also consider the potential for exposure to subsurface sediments through navigation or maintenance dredging or other maintenance activities (e.g., bulkhead replacement) that could result in exposure to subsurface sediments.
  20. Page 348, Section 8.6.1, first full paragraph. The report notes that advective porewater flux is much lower than groundwater flux for each of the key site contaminants. However, the report does not provide sufficient details regarding the basis for the noted discrepancy between groundwater flux and porewater flux. The report seems to suggest that the difference between groundwater flux and advective porewater flux is due to the sorption of contaminants within the sediment bed due to the high organic content of subsurface sediments. To the extent this statement is true, contaminated groundwater discharges will continue to load subsurface sediments in the absence of hydraulic control and containment measures.
  21. Section 8.6.1 Contaminant Fate and Transport Processes, Groundwater and porewater flow and contaminant transport.
    - a. Page 347, first sentence of the section. Revise the following text for clarity: “Dissolved and free phase contaminants can be transported from subsurface sediment into the surface sediment by the processes of porewater flow and gas ebullition, both of which have been investigated as part of this RI.”
    - b. Page 347, last paragraph. The data do not appear to corroborate the information presented. It states that contaminants in groundwater are attenuated by the organic

content of the sediments. However Figure 4-142 shows attenuation in seven locations, no attenuation in another seven locations, and the data for three locations are inconclusive. Revise the text to include further discussion consistent with the conditions noted above.

Page 349, third paragraph, second sentence. Revise the text for completeness and clarity as follows: "The depth of gas ebullition is controlled in part by the presence of organic material, which in Newtown Creek is principally deposited sewage solids, petroleum hydrocarbons, and biological growth (e.g., phytoplankton). In areas where no free-phase hydrocarbons are present, gas ebullition is not always associated with contaminant transport. Some decay occurs at or near the surface of the sediment, before mixing can occur with the underlying bed."

22. Page 350, Section 8.6.1 Contaminant Fate and Transport Processes, Gas Ebullition:

- a. Continuing paragraph. Revised this paragraph to include language that more accurately describes ebullition in Newtown Creek. Ebullition occurs during changes in hydrostatic pressure, not necessarily in areas of shallow water. Therefore, ebullition is generally expected to occur up to two times over each 24 hour period in response to tides, although the intensity and duration of ebullition may vary with the magnitude of the change in hydrostatic pressure.
- b. First full paragraph. The report notes that sheen blossoms were noted in three discrete areas in the Turning Basin, and one discrete area in the upper English Kills. Based on these observations, the CSM should note that ebullition is a potential NAPL transport mechanism in certain areas of the Newtown Creek site. As is noted earlier in the report, USEPA has required that a quantitative gas ebullition study be conducted to address this migration pathway and support FS evaluations.

23. Page 350, Section 8.6.1, discussion of processes associated with surface sediment. The CSM fails to discuss bioaccumulation of contaminants. Bioaccumulation and trophic transfer is a key process associated with surface sediments. Differences in contaminant bioavailability can affect this process. The CSM should discuss bioaccumulation as a major contaminant fate and transport process at the Newtown Creek site.

24. Page 351, Section 8.6.1, first full paragraph. The report notes that contaminants can be transported from the surface sediment to the surface water in particulate form due to propwash resuspension or storm event erosion. The report should note that erosion of the sediment bed can also release dissolved contaminants to the water column on a relatively short term basis as the sediment particles are entrained into the water column.

25. Page 351, Section 8.6.1, first full paragraph. Section 6 of the RI report concludes based on an evaluation of the sediment that the particulate phase processes of deposition of chemicals associated with sources of external solids (i.e., from the East River and point sources), as well as localized resuspension and redeposition, are important sediment/water exchange processes for evaluating chemical fate and transport in the Study Area. However, the CSM does not discuss the sediment trap data in detail. Given the importance of this process, the

CSM should include additional analysis of the sediment trap data and the particulate phase transport within Newtown Creek.

26. Page 351, Section 8.6.1, last paragraph. Based on information presented in Figure 8-14, the total PCB load to the tributaries is approximately 1.3 kg/year. Loading estimates are provided for other contaminants and other reaches. The CSM discussion should include the implications for changes in surface sediment concentrations over time. For example, future control of CSO discharges may reduce contaminant loading to Newtown Creek and enhance natural recovery processes.
27. Page 352, Section 8.6.2, last full paragraph. When discussing natural recovery processes, the report states that concentrations decline due to reductions in contaminant loads to the system. USEPA notes that reductions in contaminant loads to the system are often a prerequisite for natural recovery and that monitored natural recovery (MNR) is unlikely to occur without controlling internal and external loads to the system. However, internal loads to the system associated with contaminated sediments within Newtown Creek are likely to inhibit natural recovery. The CSM should describe the link between internal loads, external loads, and natural recovery processes.
28. Page 352, Section 8.6.2, last full paragraph. The report states that decreases in surface sediment concentrations over time are a key metric used to evaluate natural recovery processes. The report should also note the potential for subsurface sediment concentrations to be exposed due to episodic natural erosion events or anthropogenic disturbance and the potential for these events to enhance or inhibit natural recovery of contaminated sediments at the Newtown Creek site.
29. Page 354, Section 8.6.2, Natural Recovery, first full paragraph. This paragraph references “potentially unremediated upland sites.” This reference is vague needs to be clarified. It is not clear if the text is referring to Respondent sites, known hazardous waste disposal sites in a remedial program or, yet-to-be identified hazardous waste sites that may be contaminating Newtown Creek. If the phrase is referring to known hazardous waste sites, those sites should be identified or the reader should be referred to specific sections of the draft Data Applicability Report.
30. Page 354, Section 8.7, second bullet. The discussion of risk associated with consumption of fish and crab tissue from the Phase 2 reference areas seems out of place. The risk associated with exposures outside the Study Area should be discussed in the context of risk management rather than as a specific exposure scenario evaluated in the baseline risk assessment. In addition, the discussion of reference area risk and Study Area risk does not include any discussion of the relative magnitude of these risks and thus is misleading. For example, the risks to human health associated with fish consumption range between  $2 \times 10^{-4}$  and  $5 \times 10^{-4}$  which is 2.5 to 5 times higher than the reference area risks which range between  $8 \times 10^{-5}$  and  $1 \times 10^{-4}$ .
31. Page 355, Section 8.7, last paragraph. The report discusses confounding factors that appear to influence toxicity to benthic invertebrates. USEPA further notes that improvements in water quality associated with future reductions in CSO and MS4 discharges will likely

reduce the influence of non-CERCLA hazardous substance stressors. The CSM should discuss the effect of future efforts to reduce CSO, MS4 and other discharges on reducing the risks associated with non-CERCLA hazardous substances.

32. Page 356, Section 8.7, last paragraph. The report notes that striped bass are migratory and may experience exposure to contaminants outside the Newtown Creek site. However, the risks to human health were greatest for the blue crab consumption pathway, which, as the report notes, are likely to exhibit greater local exposure than striped bass. Blue crab also show the largest difference between site risk and reference area risk than the other fish consumption pathways evaluated in the BHHRA and thus should be a focus of remedial decision making for the protection of human health at the site. Further evaluation of the relationship between TPCB and other COCs in sediment and crab tissue should be conducted.
33. Page 367, Section 9.3 Sources, first paragraph, third sentence. It should be recognized in this Section that groundwater discharging at low tide along shorelines has been observed by regulatory agencies to contain elevated solids.
34. Figure 8-3. This figure depicts key processes and sources within the primary reaches of the site. However, some statements presented in the figure do not appear to be well supported in the CSM. For example:
  - a. CM 0-2: What basis is there to state that this reach reflects background conditions?
  - b. CM 2+: What basis is there to state that natural recovery is occurring?
  - c. Tributaries: What basis is there to state that natural recovery is occurring?

The CSM should be revised to provide additional documentation regarding the above statements.

35. Figure 8-6. Figure 8-6 presents average deposition rates for different reaches of Newtown Creek based on multiple lines of evidence. A complimentary figure should be prepared that presents the changes in sediment bed elevation between the 1991 and 2012 bathymetric surveys in plan view to provide higher geographic resolution of the net sedimentation rates presented in Figure 8-6. The figure should also depict any maintenance or navigation dredging that may influence the depicted changes in bathymetry.
36. Figure 8-7. It is unclear how the relative portion of the East River solids was determined. The CSM should be revised to provide additional supporting information. In addition, the chart should show the overall deposition rate along with the proportion of East River solids.

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# Section 9 Conclusions

## **General Comments**

1. Section 9 includes both a summary of the RI and conclusions and should be renamed “Summary and Conclusions”. In addition, the key conclusions of the RI should be provided in a separate Conclusions subsection.
2. The Conclusions Section should be revised to reflect and be consistent with the general and specific comments provided for Sections 1 through 8 of the RI Report.

## **Specific Comments**

1. Section 9.1 Reach-Specific Characteristics:
  - a. Page 360. This section should include the total area of the Study Area and the areas of each tributary. The range of widths for the various reaches/tributaries should also be stated.
  - b. Page 361, continuing paragraph. The final sentence is unclear and must be clarified. “By way of example, the risks to the ecological communities at many locations in the tributaries are attributed primarily to significant ongoing discharges from CSOs and MS4s. Although those ongoing discharges are traditionally regulated by the CWA, they include CERCLA hazardous substances and other pollutants and contaminants that contribute to those risks and must be considered in the evaluation of remedial alternatives in those portions of the Study Area.” The phrase “other pollutants and contaminants” should be removed and replaced with “confounding factors.” Clarify exactly what must be considered in the evaluation of remedial alternatives; the confounding factors or the discharges.
  - c. Page 362, first bullet, Sediment CM2+. This bullet should mention the 2016 Field Ebullition Survey.
  - d. Page 363, Tributaries, last bullet. This bullet fails to recognize bulk sediment concentrations as a line of evidence for benthic toxicity. The text, “other contaminants and complex mixture of organic compounds” should be removed and other documented lines of evidence should be included, i.e. bulk sediment concentrations of COPCs, etc.
2. Page 365, Section 9.2 Background, fifth bullet. It should be noted in this bullet that tissue samples from Newtown Creek are consistently higher than reference areas. Also, the final sentence should be removed or revised as it does not present a complete and accurate picture of the accumulation of COPCs in tissue. First, assuming that the migratory species move around the harbor to the extent previously described and stated in the BERA, it has to be assumed that fish collected in reference areas potentially spent some time in Newtown Creek and could have accumulated some of their body burden there. Second, the discussion

of adding tissue body burden from outside the Study Area must also emphasize that migratory fish may dilute their body burden by foraging in non-contaminated areas.

3. Page 366, Section 9.3 Sources, first paragraph, end of the last sentence. Strike the following text “therefore, the locations of impacts observed today cannot necessarily be directly linked to proximate upland sources.”
4. Page 368, Section 9.4 Fate and Transport, second paragraph, second sentence. The text states: “Larger particles settle closer to the release point, and finer particles and particles with higher organic matter content are generally transported farther.” If particles with higher organic content are generally transported farther, then the statement appears to be inconsistent with the conclusions in the RI Report that sediments in the upper ends of tributaries have higher organic content and coarser sediments due to CSO discharges. Clarify the statement to explain this apparent inconsistency.
5. Page 369, Section 9.4 Fate and Transport, second full paragraph. The text states: “Residual NAPL, the condition where the NAPL saturation is sufficiently low that the NAPL consists of discontinuous blebs, is trapped by capillary forces and is, therefore, immobile.” No data have been collected to date related to NAPL mobility; such data will be collected as part of the FS Field Program. Provide the basis for the assertion that NAPL is immobile. In addition, revise the text to note that residual NAPL, even if immobile, can serve as a long-term source of dissolved contaminants to groundwater.
6. Page 370, Section 9.5 Risk, second bullet. Section: Change “...primarily due to PCBs...” to “...primarily due to PCBs and dioxins/furans.”
7. Page 370, Section 9.5 Risk, second Bullet. Replace the second sentence with: “... indicating that risks in the Study Area may continue to be above acceptable levels due to background levels of contamination.”
8. Page 371, Section 9.5 Risk, last bullet. The text reads as follows: “...there are confounding factors that appear to be influencing toxicity to the benthic invertebrates in the tributaries near CSO and MS4 outfalls. Moreover, ongoing anthropogenic contributions to the Study Area can impact the ecological environment because of lower DO and salinity, whereas the constructed shoreline of the Study Area and lack of vegetation limits intertidal habitat that places restrictions on bird and mammal foraging.” These statements are unbalanced in that they fail to address impacts on benthic habitat from internal sources in the sediment derived from discharges and releases of contaminants from historical operations along the creek. Revise the text to include impacts of legacy contaminants in the creek.
9. Page 371, Section 9.5 Risk, first bullet. The text states: “In these samples, the toxicity results appear to be confounded by a complex mixture of organic compounds that are not addressed in this RI but are linked to the proximity of CSOs, MS4s, and other stormwater discharges.” Delete this sentence. If the RI data do not include data representing the “complex mixture of organic compounds” referred to in the sentence, then the RI report should not address such data.

10. Page 372, Section 9.6 Data Limitations, first full sentence. Include shoreline erosion and additional groundwater data collection that are planned as part of the FS Field Program.
11. Section 9.7, Summary, Page 372 – The first paragraph of this section states that surface sediment contamination influences ecological and human risks. Limiting the source of risk oversimplifies the CSM where migration of NAPL and dissolved contaminants in groundwater can impact concentrations of COPCs in surface water. The summary should be more comprehensive.

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# Appendix F

## **Specific Groundwater Model comments**

1. Page 4, Section 1.2.1 Approach to Estimating Groundwater Discharge, first bullet. The sixth sentence indicates that upland hydraulic properties were calibrated to match seepage rates. The intention of the work plan was to characterize discharge to the creek through a number of different methods, then evaluate and discuss the differences to arrive at the best estimate based on multiple lines of evidence. Discuss conclusions regarding why seepage rates might differ from upland property estimates should be discussed. Perhaps the seepage rates in some segment groups should be calibrated to upland hydraulic properties.
2. Page 5, Section 1.2.2 Approach to Estimating Chemical Loads, second/middle paragraph. It states: "Due to the protracted history of industrial development...the locations of elevated TPAH, TPCB, and Cu concentrations...cannot be definitively linked to proximate sites." This needs to be demonstrated through systematic comparison between Study Area water quality and sediment contamination data and the data from upland sites, to determine if there are statistically significant correlations. Revise the document accordingly.
3. Page 16, Section 3.5.2 Upland data. There appears to be a wide range of hydraulic conductivity values both from slug tests and pumping tests. Slug tests are subject to well effects, therefore estimates from pumping tests should generally be considered more reliable. The range of values suggest that wells were screened in very different formation material. Add a discussion of the relative portions of the different materials in the soil column to either the use of arithmetic averaging or a more representative distribution of the hydraulic conductivities.
4. Page 17, Section 3.5.3.1 Slug Tests, third paragraph, second sentence.  $4.1 \times 10^{-5}$  centimeters per second (cm/sec) is equivalent to 0.11 foot/day, not 1.1 feet/day. Revise accordingly.
5. Page 28, Section 3.7.2.1.1 Sensitivity Analysis, last paragraph. Incorporate the impacts of NAPL presence; include the range of results from the least to most conservative. It is currently unclear in the text why all three methods are presented while the results of the more conservative methods are discounted entirely.
6. Page 39, Section 4.3.1.1 Groundwater Withdrawal, first full paragraph. The base flow rate for predevelopment conditions needs to be increased significantly, due to a misinterpretation of the modeling results in the cited United States Geological Survey (USGS) modeling report (Misut and Monti, 1999). Thus, the current condition base flow rate also needs to be increased significantly because the water table has rebounded to predevelopment levels, except for the zones that are being controlled by remediation pumping.

The misinterpretation of the USGS modeling results can be explained through examination of Figures 5 and 7 on pages 14 and 16 of the USGS report. Figure 7 shows the seven model cells that the USGS simulated as "stream" boundary cells, while Figure 5 displays the

boundary cells for representing the mean sea level shoreline. Figure 5 shows that the USGS simulated the Study Area with the shoreline boundary condition, whereas the Figure 7 stream cells were placed only further inland to represent an upland drainage channel that is apparently now gone. Therefore, the predevelopment base flow in Table 3 on page 9 of the USGS report represents only the simulated groundwater discharge to those seven upland stream cells. The USGS report does not separately tabulate the groundwater discharge rate to the shoreline boundary cells that simulate the Study Area; however, the groundwater discharge to those shoreline Study Area cells must be significantly higher than the 2.5 cubic feet per second (1.6 million gallons per day [MGD]) simulated base flow to the upland stream cells. This is because the contributing area is on the order of 10 to 15 square miles based on the water table contour map shown on Figure 3A on page 10 of the USGS report (which is roughly the same as the RI report's PGCA), and the USGS-simulated net recharge rate in Queens and Brooklyn was 160 MGD (Table 2 on page 9 of the USGS report) across an area of about 150 square miles (or approximately 1.1 MGD per square mile). Because other outflows were negligible during predevelopment, this means that the USGS-simulated groundwater discharge to the Study Area was about 11 to 16 MGD for predevelopment conditions. Given that the USGS reduced the simulated recharge to the water table to 136 MGD for representing 1983 conditions (Table 2 on page 9 of the USGS report), the equivalent predevelopment Study Area groundwater recharge rate would be approximately 9 to 13 MGD. Further, given that the current water table contour map is very similar to the predevelopment map shown in Figure 3A of the USGS report, the current base flow to the Study Area must be very similar to the 9 to 13 MGD. If the 1.6 MGD simulated as predevelopment "stream" base flow by the USGS is also accounted for, the current total base flow to the Study Area would total to 11.6 to 14.6 MGD before accounting for other discharges.

Revise accordingly.

7. Page 41, Section 4.5.2.2 Loss to Sewer pipes, second paragraph. This section references a Greeley and Hansen 1982 report for the estimate of infiltration to sewers in the PGCA, based on reported extraneous flow. There appears to be subsequent reports, including a 1993 Newtown Creek Water Quality Facility Planning. Project, Task 3.0 Sewer System Evaluation Survey and a 2011 Waterbody/Watershed Facility Plan that indicate extraneous flow is a result of other factors and that infiltration is much lower. Resolve this difference as it has significant implications to the water balance presented in Section 5 of Appendix F (5.1.2 Outflow).
8. Page 49, Section 5.1.2.2 Dewatering: The Metropolitan Transportation Authority (MTA) indicated (through correspondence with EPA) that the only dewatering within the subway lines is through "muck trenches" located directly underneath the rails. These muck trenches drain infiltrating groundwater by gravity to nearby Pump Rooms, where the collected water is then pumped to sewers. Because of time limitations cited by MTA personnel associated with accessing files, EPA requested that MTA calculate the amount of pumping from approximately half of the pump rooms within the PGCA. The locations were selected to be representative of the full set of stations throughout and just beyond the edges of the PGCA. The stations are representative of hydrologic conditions for the full set of stations, including

locations where the subway tubes and stations intersect or are below the water table, as well as above the water table. Information collected included key stations near the downstream portion of the Study Area, given the USGS seepage meter result there that produced some very large negative values.

The total dewatering rate based on half of the stations was 0.03 MGD. There is also one deep well within the PGCA (Maspeth Deep Well) that was historically used for dewatering EPA's contact at MTA (Francine Ocampo) has indicated that this well is no longer operating. Thus, the pumping rate from all MTA subway facilities in the PGCA can be estimated to be 0.06 MGD. Revise accordingly.

9. Page 51, Section 5.1.3 Tier 1 Results. Correcting for much lower loss of groundwater and potentially higher precipitation infiltration reverses the conclusion of net negative groundwater flow into the Study Area. Incorporate this revision throughout the report main text and Appendix F, and any other passages that cite this conclusion – as well as during planning and implementation of FS stage field data collection, modeling, and interpretation of results.
10. 51 to 60, Section 5.2 Tier 2 Analysis of Segment Groups. Regarding the overall approach, incorporate consideration of the potentially significant amount of (very) shallow seepage and a non-uniform distribution laterally from shoreline to shoreline. Conduct cross-sectional numerical modeling to improve the conceptual understanding in this regard. In addition, perform such modeling in support of the planning and implementation of FS stage field data-collection, modeling, and results interpretation.
11. Pages 51 to 60, Section 5.2 Tier 2 Analysis of Segment Groups. Back-calculated net recharge rates, which appear not to be discussed, range widely from Segment to Segment, with at least one of the Segment's rate (40+ inches/year) well beyond a reasonable upper limit, and another one (approximately 16 inches/year) being the only one near the County-wide average rates for Brooklyn and Queens as simulated by the USGS (Misut and Monti, 1999). All the other back-calculated net recharge rates are very low (generally 3 inches/year or less) and thus well below the County-wide averages. Similarly, the back-calculated transmissivity and hydraulic conductivity values range widely from Segment to Segment, and the spatial variation of the back-calculated values has not been linked to changes in the geologic sediments' characteristics or to Segment-specific hydraulic testing data on a Segment-by-Segment basis. In addition, there are very abrupt differences going from Segment to Segment, with examples of this in the back-calculated values for net recharge and hydraulic properties (transmissivity and hydraulic conductivity), yet without substantiation for the abruptness. The very wide range of back-calculated values and the abrupt changes from Segment-to-Segment demonstrate the need for an improved conceptual model of groundwater seepage as part of FS stage supplemental data-collection, data evaluation, and modeling. Revise accordingly.
12. Pages 53 and 54, Section 5.2.1 Calculation of Seepage Rates from Long-Term Monitoring Data, final 2 paragraphs. The estimated anisotropy ratio for native sediments ranging from 1 to 3 is well below values typically used in representing (modeling) such sediments. The USGS report (Prince and Schneider, 1989) cited as the basis for this estimated range

actually includes information contradicting a high end of 3:1, as follows: (a) The report's Table 1 cites other USGS studies that produced values as high as 16:1 to 24:1 on the high end; and (b) the authors' own field testing and data evaluations produced ratios as high as 6.5:1. Later USGS efforts, which are cited for other information in this RI report, included numerical modeling studies in which anisotropy ratios of 10:1 were simulated (Misut and Monti, 1999, for example). Moreover, even higher anisotropy ratios should be assumed for the native riverine sediments of the Study Area, because of stronger stratification effects. This indicates that the evaluation of horizontal hydraulic conductivity results from analysis of recently conducted RI stage slug testing have produced estimates of vertical hydraulic conductivity that are significantly too high. Thus, the basic conceptual model for groundwater discharge into the Study Area needs to be re-examined. Along all shoreline segments, a significantly lower vertical hydraulic conductivity within the Study Area footprint would focus more groundwater flow to seep out laterally and/or discharge very locally right along the shoreline. In addition, where saltwater intrusion is a factor, the saline groundwater wedge would enhance this effect. As indicated in other comments for Appendix F, numerical cross-sectional modeling is needed, to conduct conceptual model hypothesis-testing and sensitivity analyses for improving the conceptual model understanding, and thereby, to help guide the planning and implementation of FS stage field data collection and modeling – toward a defensible, technically-sound interpretation of groundwater seepage into the Study Area. Revise accordingly.

13. Page 55, Section 5.2.2 Interpolation of Seepage Rate on Model Grid, final paragraph. EPA fully supports collecting more data to improve the understanding of groundwater seepage spatial distribution, the range of seepage rates, as well as the chemical concentrations in such seepage. Incorporate this new data into calculations and modeling activities/documentation once it is available.
14. Page 59, Section 5.2.6.1 Segment Groups C and K, both paragraphs. Augment the conclusion that induced infiltration predominates in Segment Groups C and K by providing salinity and/or specific conductivity data from sampling of the remediation pumping wells. Because the estimated rate of induced infiltration is roughly half of the total remediation pumping rate, and assuming steady state hydraulic conditions have been in effect for many years, the salinity and specific conductivity of the pumped groundwater should be significantly impacted by the amount of surface water induced into the local groundwater flow system. Similarly, the groundwater along induced infiltration flow pathways from the Study Area to the remediation pumping wells should have been showing increased salinity and specific conductivity.
15. Pages 65 to 67, Section 6 Chemical Load Estimates, 5th through final paragraphs. It is very important and significant to note that if NAPL affected the measured groundwater concentrations, this does not mean that the groundwater loading triggered by groundwater seepage is biased high. Without definitively identifying the source of the NAPL, the source could be from upland sites either via subsurface transport or riverine sedimentation. This accentuates the need for evaluating potential sources systematically (as indicated in a prior comment), and it also emphasizes the need for improving the characterization of the effects of NAPL during the FS stage. Revise the RI accordingly.

16. Pages 68 through 74, Section 7 Sensitivity Analysis, all portions. Postpone sensitivity analyses regarding groundwater seepage impacts until the FS stages because of the need to collect additional data and improve the conceptual model understanding, which is anticipated to lead to significant improvements in simulating the spatial distribution of groundwater seepage and the rates of flow and COPC mass discharge into the Study Area. In addition, prior to conducting FS stage sensitivity analyses, the analyses need to be discussed in detail, including the identification of parameters to adjust, the setting of parameter ranges, and the criteria/metrics used for interpreting the results. Revise accordingly.

# Appendix G

## **Geo-Neutral Point Source Model**

### **General Comments**

1. Appendix G and Geo-Neutral Point Source Model Evaluation Overview notes; Assessment of RI Geo-neutral Newtown Creek and Bowery Bay InfoWorks models: The InfoWorks model used in the RI to generate flows from the NYC collection system to Newtown Creek is generally consistent with the NYC model, and reasonably produces the results presented in their report and in the digital files provided to EPA. As the exact model was not provided, and the version of InfoWorks (ICM 7.5) used by EPA to check the model likely differed from the older InfoWorks CS version used for the RI, small differences observed in the results were expected. In addition to the numbered comments presented below, identified issues include:
  - a. Hourly data were used for the simulations. The models were calibrated to 5-minute data. Use the same data frequency as input for simulation of CSO discharges to receiving waters.
  - b. The Bowery Bay model EPA reviewed did not run without a few minor modifications. As the model appears to have been prepared by NYC and merely passed along via the NCG, this issue was likely due to an integrity check in the newer software that was not present in older versions of the software
2. Appendix G and Geo-Neutral Point Source Model Evaluation, Precipitation Data for Newtown Creek InfoWorks model: EPA will convene a meeting with technical representatives of the NCG, NYCDEP, and NYSDEC (similar to the modeling working group meetings) within the next 30 days to identify the appropriate precipitation data set to be used in the Geo-Neutral Point Source Model for the Newtown Creek site as part of the CERCLA RI/FS process. EPA will provide additional communications regarding this meeting within 5 business days of this comment transmittal.
3. Appendix G and Geo-Neutral Point Source Model Evaluation, discrepancy between meteorological stations and comparable daily datasets: For some years, there is a discrepancy between the hourly data reported for the meteorological stations and the comparable daily datasets. The daily data are generally the most reliable. The hourly data were frequently deficient in the early years of the ASOS program from the late 1990s through the early 2000s. Hourly data at LaGuardia from 1996-2005 in some years is 6 percent less than the reported daily totals. This discrepancy has largely been rectified more recently, but the 2012 hourly dataset is also deficient, with 3 inches less precipitation than its daily counterpart. Base CSO simulations with the objective of representing loads to the receiving waters on precipitation datasets adjusted to incorporate the reported daily precipitation totals.

Geo-Neutral Point Source Table 1 (included at the end of this section) presents annual precipitation for Central Park, LaGuardia, and JFK from daily datasets, along with annual precipitation at LaGuardia from its hourly dataset.

4. Appendix G and Geo-Neutral Point Source Model Evaluation, precipitation data frequency: As the RI's goal was to produce best estimates of CSO discharges, use the same precipitation timestep as was used in model calibration. Using data with a longer timestep results in smaller peak runoff rates, and thus underestimates CSO. Various means are available for obtaining sub-hourly data. Since the early 2000s, each principal weather station has recorded 1-minute data via the Automated Surface Observing System (ASOS). These data are not quality-controlled by NOAA, but are available to the public, and are generally of good quality. Hourly data can also be synthetically disaggregated to develop high frequency datasets that reproduce the variability expected in short-duration measurements, or other stations in the area could have been used to inform development of long-term 5-minute time series.
5. Appendix G and Geo-Neutral Point Source Model Evaluation, evaporation: Appendix G of the RI states: *"Daily evapotranspiration data were obtained from the Northeast Regional Climate Center at Cornell University. The NCB portion of the 2015 geo-neutral point source model used LGA evapotranspiration data for 1999 and CPK data for the 2000 to 2012 period because CPK evapotranspiration data were not available before 2000. The BBL portion of the 2015 geoneutral point source model used LGA evapotranspiration data for the entire 14-year period."* However, no evapotranspiration data for either site are reported to the National Weather Service. While pan evaporation was measured at Central Park from 1944-1958, evapotranspiration is usually derived from measurements of air temperature, solar radiation, vapor pressure, and wind speed. InfoWorks requires free surface evaporation as input; this value can be considered the same as potential evapotranspiration (PET) for this modeling. PET is usually greater than actual evapotranspiration.

The InfoWorks input data indicate annual average evaporation of 28.9 inches (736 mm) for the Newtown Creek area, and 26.2 inches for Bowery Bay. While the methodology is not discussed in the report, it is likely NRCC's adaptation of a PET model for a grass-covered surface described on the Cornell website ([www.nrcc.cornell.edu/wxstation/pet/pet.html](http://www.nrcc.cornell.edu/wxstation/pet/pet.html)), as the results nearly match monthly averages presented there for LaGuardia. Other methods of estimating PET or free surface evaporation yield higher annual averages:

- a. NWS atlases 33 and 34 (Farnsworth et al., 1982) present pan evaporation estimates nationwide, and coefficients for converting these estimates to free surface evaporation. Annual pan estimates for LaGuardia and Newark are 54.55 and 49.69 inches, and the conversion coefficient for the area is 0.78, yielding free surface evaporation of 42.5 in/y and 38.8 in/y, respectively.
- b. Vogel and Sankarasubramanian (2015) present PET estimates for 1,469 sites nationwide based on the Hargreaves-Samani method. The nearest sites in their dataset are Chatham NJ (20 miles west of Newtown Creek) and Mahwah NJ (30 mi NW) with respective estimates of 41.4 inches/year and 40.0 in/y.

- c. Application of the Hargreaves-Samani (1985) method using 1999-2012 Central Park and LaGuardia daily temperatures for Newtown Creek (latitude 40.74°N) yields 36.2 in/y and 35.8 in/y, respectively.
- d. Application of the Hamon (1961) method for free surface evaporation based on Central Park and LaGuardia daily temperatures for 1999-2012 at Newtown Creek (latitude 40.74°N) yields 30.7 in/y and 31.8 in/y, respectively.

The estimates used in InfoWorks thus appear low. Additionally, the rationale for the 10 percent difference between Newtown Creek and Bowery Bay is not apparent. While evaporation is a small component of the water balance in urban runoff, and the impact of its underestimation is likely small, underestimation of evaporation yields slightly more runoff, and thus likely slightly overestimates CSO. Apply the Hargreaves-Samani method with LaGuardia daily temperatures for determining daily evaporation boundary conditions.

**Table 1. Annual Precipitation (inches)**

Year	JFK	NYC	LGA	LGA
	Daily	Daily	Daily	Hourly
1990	45.24	60.92	51.22	51.32
1991	38.73	45.18	38.16	38.16
1992	38.38	43.35	37.40	37.40
1993	35.61	44.28	43.16	43.16
1994	43.33	47.39	43.49	43.45
1995	34.42	40.42	35.31	35.35
1996	51.45	56.19	49.12	46.12
1997	39.87	43.93	45.37	45.30
1998	37.55	48.69	45.21	44.32
1999	40.10	41.51	41.07	39.80
2000	41.02	45.45	42.48	39.84
2001	32.72	35.65	33.97	32.07
2002	43.13	45.20	44.84	42.01
2003	44.77	58.42	54.96	51.82
2004	50.95	51.93	50.68	49.61
2005	49.55	55.97	48.16	45.40
2006	44.80	59.89	53.95	53.95
2007	46.91	61.67	53.43	53.43
2008	46.26	53.61	47.84	47.79
2009	45.88	53.62	46.33	46.26
2010	42.47	49.37	40.63	40.30
2011	55.78	72.81	65.34	65.33
2012	39.85	38.51	36.71	33.23
2013	35.48	46.32	38.29	38.14
2014	50.75	53.79	50.31	50.08
2015	38.31	40.97	37.20	38.55
2016	36.01	42.17	39.39	37.89
Average	42.57	49.53	44.96	44.08

**Table 1 Data Sources**

1. NOAA 2016 Local Climatological Data Annual Summary with Comparative Data New York, JFK International Airport (KJFK), National Centers for Environmental Information, Asheville, NC [www.ncdc.noaa.gov/IPS/lcd/lcd.html](http://www.ncdc.noaa.gov/IPS/lcd/lcd.html)
2. NOAA 2016 Local Climatological Data Annual Summary with Comparative Data New York, La Guardia Airport (KLGA), National Centers for Environmental Information, Asheville, NC [www.ncdc.noaa.gov/IPS/lcd/lcd.html](http://www.ncdc.noaa.gov/IPS/lcd/lcd.html)

3. NOAA 2016 Local Climatological Data Annual Summary with Comparative Data New York, New York, New York (KNYC), National Centers for Environmental Information, Asheville, NC  
www.ncdc.noaa.gov/IPS/lcd/lcd.html
4. NOAA, 2016. LGA hourly 1990-2013: www.ncdc.noaa.gov/cdo-web/search?datasetid=PRECIP\_HLY#
5. NOAA, 2016. LGA hourly 2014-2016: www.ncdc.noaa.gov/qclcd/QCLCD

### **Specific Comments**

1. Figure G3-19. The value for 2012 appears to be incorrect; it should be 38.5 inches, not 49.5 inches. Verify and correct the value.
2. Page 31, Section 3.5.1 Diagnostic Analysis of 2015 Geo-Neutral Point Source Model. Present annual precipitation 2008-2012 for Central Park (NYC) and LaGuardia Airport (LGA) in a table. The values from the Global Historical Climate Network (GHCN) daily dataset are provided below.

<b><u>Year</u></b>	<b><u>NYC</u></b>	<b><u>LGA</u></b>
2008	53.61	47.84
2009	53.62	46.33
2010	49.37	40.63
2011	72.81	65.34
2012	38.51	36.71
Average	53.58	47.37
Min	38.51	36.71
Max	72.81	65.34

3. Page 35, Section 3.6, Model Application:
  - a) LGA precipitation averages given as 46.0 for 1999-2012 and 44.4 for 1980-2012. Review of the rainfall records indicate 47.2 and 44.9 for these same periods, respectively, from the GHCN daily dataset. Verify that the values are correct or explain the discrepancy.
  - b) Explain the significance of using 1980-2012, and the 14- and 50-year periods used for Central Park. Uninterrupted daily records for NYC begin in 1876, and for LGA in 1944.
4. Page 36, Section 3.6 Model Application, third paragraph. Evapotranspiration data for either the Northeast Regional Climate Center at Cornell or the La Guardia location could not be located for recent decades. Cornell likely provided estimates based on a method such as Penman-Monteith. It is not clear why such estimates would be available for only part of the time period. Clarify the source and type of evapotranspiration data should be clarified.

## **References**

Farnsworth, R.K., Thompson, E.S., and Peck, E.L, 1982, Evaporation atlas for the contiguous 48 United States, NOAA Technical Report NWS 33, National Oceanic and Atmospheric Administration, Washington, DC, p. 27.

Farnsworth, R.K. and Thompson, E.S., 1982, Mean monthly, seasonal, and annual pan evaporation for the United States, NOAA Technical Report NWS 34, National Oceanic and Atmospheric Administration, Washington, DC, p. 85.

Hamon, W.R., 1961, Estimating potential evapotranspiration: Journal of Hydraulics Division, Proceedings of the American Society of Civil Engineers, v. 87, p. 107–120.

Hargreaves, G. H., and Samani, Z. A. (1985). "Reference crop evapotranspiration from temperature." Appl. Eng. Agric., 1(2), 96–99.

Vogel, R.M., and A. Sankarasubramanian. 2015. Monthly Climate Data for Selected USGS HCDN Sites, 1951-1990, R1. ORNL DAAC, Oak Ridge, Tennessee, USA.

## **Hydrodynamic and Sediment Transport Models**

### **General Comments**

1. Review of the graphics and text describing the tide boundary condition at the northern boundary suggests that the model input was the result of a calibration exercise. The use of a calibrated boundary condition is not standard practice and is not technically defensible. In addition, using the calibrated boundary instead of the correct water levels has an impact on water levels and currents in the project area. Given these arguments, EPA strongly recommends the use the Lower Passaic River and Newark Bay Superfund or NYC LTCP regional model (or outputs of one of these same models) to specify the tide at the northern boundary; boundary conditions for temperature and salinity can also be specified using the outputs of the selected regional model.

Furthermore, not driving the hydrodynamic and salinity transport model with a regional model propagates unnecessary uncertainties into both the sediment and contaminant transport models. If this change is not made, EPA strongly recommends that an independent assessment be made to quantify the impacts of using the extrapolated boundary conditions in the East River on the transport of both water and salinity, as well as using these results to simulate the transport of sediments and contaminants.

2. Although a tremendous amount of work has gone into the development of the sediment transport model, the values of certain parameters (e.g., settling velocity of the fine sediment size class) required the use of values that are not usually measured for flocculated sediments in estuarine waters. EPA recommends that additional validation is performed (e.g., showing comparisons between simulated and measured suspended sediment concentration profiles at different locations in Newtown Creek under different tidal and runoff conditions). As is, and considering the issue mentioned in General Comment No. 3 below, EPA is concerned about the accuracy of the sediment transport model when used for driving the chemical fate and transport model. EPA strongly recommends that the model and report be revised accordingly.
3. Although a diagnostic analysis was performed for the simplified representation of sediment transport in the East River, it does not appear that the impact on sediment transport in the East River has been thoroughly assessed. This concern will increase with the use of chemical fate and transport model to simulate the transport and fate of sorbed contaminants on sediments that are being transported out of Newtown Creek into the East River and vice versa. EPA is concerned that the use of a simplified sediment transport model for the East River to represent the transport and fate of sediments and sorbed contaminants exchanged between the East River and Newtown Creek will not accurately represent these processes.
4. Propwash Resuspension Submodel: Revisions to propwash resuspension submodel described in Section 2.2.2.4 of the Final Modeling Results Memorandum (FMRM) represent a vast improvement to the first version of the submodel.

5. Verification of Model Inputs: Verification of the model inputs could not be performed because the input files for this submodel were not provided. The goal of this task is to insure the inputs were correctly specified in the input files. Provide these inputs when they are ready.
6. Verification of Model Calculations: The calculations of the propwash resuspension submodel were checked by reviewing the model code to verify that the submodel computes bed scour due to propwash correctly as given in Section of Attachment G-K (Details of Propwash Resuspension Submodel Structure and Formulation). The finding from this task was that the code in the `sed_sedflx_SEDZLJ.f` subroutine correctly represented the equations for propeller thrust, velocities in the zone of flow establishment and the zone of established flow, and the calculation of bed scour due to propwash. The novel subgrid approach used to calculate scour within a grid cell due to propwash from a moving ship is impressive.

However, as stated above, the lack of input files did not allow verification of the parameters and variables used in the calculation of bed scour due to propwash. As a result, it was not possible to verify that correct values for the parameters are being used in the calculations and that variables in this submodel are being calculated correctly.

7. Benchmarking of Model Outputs: The lack of input files did not allow verification of integrity of output from the model by recompiling the source code, re-running the one- year simulation in which the propwash submodel was activated with the generated code executable, and comparing the model results from this simulation to the results (as described by Hayter [2016]).

Provide all input files for the propwash resuspension submodel prior to submittal of the chemical fate and transport model to EPA for review.

8. The sediment mass loss associated with the simulated tide-induced wetting and drying during a one-year model run was investigated to determine if the use of  $H_{DRY} = 0.1$  m and  $H_{WET} = 0.13$  m was satisfactorily mass conserving. The results of this evaluation determined that sediment mass loss was minimal, and thus the model did satisfactorily conserve sediment mass. This check is important in models in which simulated wetting and drying occurs since all wetting and drying routines are relatively crude approximations that are not based on first principles of mass, momentum and energy conservation.
9. The FMRM should be a comprehensive documentation of the modeling study. Currently, it is structured partially as a document describing the refinements to the PMRM model (for example, see the discussion in Sections 4.1, 5.1 and 7.2). Either (1) include the PMRM as an attachment to the FMRM, or (2) simplify the FMRM text to discuss only the final model framework/formulations.
10. The continuous salinity data used for model calibration are not synoptic with the rest of the hydrodynamic data and are also available only for three months during a relatively dry period. The report indicates that nine months of synoptic continuous data were determined to be unreliable due to sonde calibration issues. Present a more detailed explanation of this problem (and how it can be avoided in the future) and describe how it affected sondes at all the locations

for the complete 9-month period (e.g., this issue limits the validation of the model during large point source discharge events).

11. Hydrodynamic model calibration is discussed in the text using one single statistical value per variable. This results in grouping of all the information from different stations, environmental conditions (dry- and wet-weather), etc. Present a more detailed evaluation of the model performance with statistical evaluation for individual locations and during specific conditions that are important for the project. The statistical evaluation should be performed and discussed in the text for the individual locations, using the metrics of bias and ubRMSD already included in the FMRM, as well as relative bias. Since the potential application of this model includes testing various remedial/management strategies, including source control, present an evaluation of model performance during specific environmental conditions such as dry-weather and large point source discharge events. In addition, model-data comparisons in tidal environments are typically performed by comparing model results to the measured amplitude and phase of various tidal constituents. Include such a quantitative comparison of the tidal constituents in the evaluation (this is applicable to both water level and currents).
12. The FMRM document is missing an analysis/discussion of the dominant fate and transport processes for sediments within Newtown Creek which need to be reproduced by the numerical model. Specific questions to be addressed include:
  - a. What are the fate and transport processes evident in the data?
    - i. Over tidal timescales during dry-weather conditions
    - ii. During wet-weather conditions
  - b. What processes are important for fate and transport and need to be represented in the model?
    - i. How important is erosion and deposition of sediments under both wet weather and dry weather tidal conditions?
    - ii. Does erosion not occur under normal tidal conditions, as the model currently suggests? Is this consistent with what is happening in the Creek?
    - iii. How important is navigation scour for fate and transport of sediments? Is it locally important (e.g., formation of scour holes), or is it globally important?  
Such an analysis and discussion will ensure that relevant fate and transport processes have been appropriately incorporated into the model framework, and provide confidence in model projections for the future. Revise the document to include these analyses/discussions.
13. NSRs represent the only calibration metric in the FMRM sediment transport model application. As such, a number of datasets have been analyzed to support evaluation of the calibration – bathymetric differencing (1991-2012, 1999-2012, 1999-2011, and 1991-1999), geo-chronology cores, and historical dredging records. These analyses are presented in two separate Attachments (G-G and G-H). The results of these analyses are presented in Figure G5-5 and G5-6 without attempting to reconcile what seems, at first glance, very different NSRs between methodologies. For instance, the various lines of evidence for NSRs in Maspeth Creek vary by approximately one order of magnitude (~0.75 cm/yr to 7 cm/yr). Revise the report to include

an analysis and associated discussion of the NSRs from the various lines of evidence. Per EPA's review, accounting for navigation history and sources of bias in the bathymetry data and geochronology cores, the various lines of evidence tend to roughly similar conclusions on the current NSRs in the various tributaries. That is an important conclusion that indicates consistency amongst the various lines of evidence, and strengthens the resulting NSR calibration metric for the numerical model. Revise the document to state this.

14. Some of the assumptions and statements in the FMRM document are either not presented, or presented without adequate evidence and justification. For instance, Section 5.2.2 Data-Based Mass Balance Analysis, includes an implicit assumption of no deposition in the tributaries of solids originating from the East River and the Main Stem, with no overt mention in the text. The same section also includes the statement "more than 90% of tributary deposition is due to point source sediment loads". However, no evidence or discussion is provided in support of this statement. Revise the text so that all assumptions and statements are explicitly listed, justified, and discussed.
15. Several figures are presented in the text without adequate explanation of the information in the graphics, nor a presentation/discussion of the conclusions from the graphics. Specific examples include Figures G5-5, G5-6, G5-28, G5-36, etc. Revise the text with adequate description and discussion of the information presented in each figure and associated conclusions.
16. The notion of temporal decline in point source loadings over time is currently presented in several places, e.g., Attachment G-G, Attachment G-I, Appendix G Section 5.2.1, etc. Given the potential importance of this topic to the historical evolution of the study area, revise the document to include a separate section or attachment exploring this hypothesis, and presenting the various lines of both direct and indirect evidence.
17. The TSS boundary condition at the East River boundary is defined in a relatively simplistic manner, as a temporal and vertical-average value. This approach neglects potential seasonality in TSS and vertical gradients that are relevant in the presence of estuarine circulation. Review the TSS data for temporal (seasonal as well as spring-neap) and vertical gradients and incorporate into the model boundary conditions, as appropriate. This will result in a TSS boundary condition that is better constrained and may help improve model-data comparisons for TSS.
18. The FMRM model application involves a relatively large number of calibration parameters compared to calibration metric (only NSR). Calibration parameters include:
  - a. Wash load fraction of East River solids load
  - b. Flocculated clay/silt fraction of East River solids load
  - c. Fine sand fraction of East River solids load
  - d. Settling velocity of flocculated clay/silt from East River
  - e. Settling velocity of flocculated clay/silt from point sources

- f. If including propeller scour, then
  - i. Settling velocity of scoured cohesive sediments
  - ii. Probability of resuspension

This is a relatively large number of calibration parameters ( $n=7$ ) compared to the number of calibration metrics ( $n=1$ ). The primary concern generated by this comparison is the possibility of obtaining non-unique solutions. In other words, there may be multiple combinations of parameter values that can result in a good model performance relative to the sole calibration metric. In addition, the settling velocity of the wash load from East River is based on an assumed value. EPA strongly recommends developing data-based methodologies to reduce the number of calibration parameters. This will lead to unique parameter values, and inputs that are data-based and technically defensible.

19. In general, several sediment transport model inputs and parameters that should be treated as model input are either assumed (e.g., particle diameters for the fine and medium-coarse sand classes, settling velocity of wash load) or are subject to calibration (the wash load, flocculated clay/silt, and fine sand fractions of suspended sediment entering at the East River boundaries). For instance, the particle diameters of the fine and medium-coarse sand fractions can be determined from bed grain size distribution measurements conducted as part of the RI program. Similarly, the various size fractions at the East River boundaries should be based on measurements as was done for the point source loadings. The settling velocity of the wash load fraction can be calculated using Stokes Law based on the measured particle diameters and specific gravities associated with this size class. EPA recommends revising the model to parameterize inputs using site-specific data as described above to minimize the potential for model artifacts that may arise from assumed/calibrated inputs.
20. The FMRM sediment transport model application has been calibrated to a single metric (NSRs). This approach can result in a biased model if the calibration metric also happens to be biased or affected by some artifact. The typical approach for sediment transport model applications for Superfund as well as other environmental applications is to calibrate to multiple lines-of-evidence. Such an approach will facilitate identification of biases in individual datasets (if such biases do not affect all metrics) and allow these biases to be suitably addressed as part of the model calibration. Additional calibration metrics for Newtown Creek include TSS measurements from water samples, TSS time-series estimated from the bulkhead turbidity measurements during Phase 2, limited TSS time-series estimated from Acoustic Backscatter (ABS) measurements by ADCPs during Phase 1, and limited suspended sediment fluxes using ABS data. Establishing model calibration over several metrics will allow calibration over various spatial and temporal scales and ensure that the resulting model performance is more robust and more rigorously tested. In addition, reviewing model results relative to TSS time-series data will also demonstrate model performance over varying time-scales and environmental conditions, e.g., tidal timescales (dry-weather), wet-weather conditions, navigation scour events, etc. EPA strongly recommends revising the model calibration strategy to use such a multiple lines-of-evidence approach to establish model calibration.
21. The FMRM model includes the application of detailed mechanistic sub-models of prop-wash and scour as a diagnostic evaluation. Although the prop-wash model has been calibrated (in a probabilistic manner) against measurements of near-bottom velocity during ship passage, the

resulting impact on sediment transport has not been calibrated or validated. Impacts include scour and resuspension, and although turbidity data exists that show resuspension events due to propeller-induced scour, these data have not been used to calibrate or validate the model. In addition, the application of the sub-model for propeller-induced scour introduces two new calibration parameters, representing controls on both the erosion as well as deposition of resuspended sediments. This calibration process and calibration parameters represent calibration of both sources and sinks of suspended sediment, potentially resulting in non-unique parameter estimates. It is also not clear what are the reasonable range of values for these new parameters. The future calibration strategy for the propeller-scour sub-model is not clear. The long-term performance of the propeller-scour sub-model is also not demonstrated. The propwash-induced scour can be considered a fully tested and validated sub-model only if shown to suitably reproduce the turbidity (TSS) measurements indicative of the resuspension due to propwash-induced scour and followed by deposition of these sediments. EPA recommends revising the propeller-scour sub-model to (1) avoid additional calibration parameters (this may potentially be achieved by using the measured Sedflume erosion properties and settling velocity established as part of the model calibration), (2) validate the scour and resuspension processes using the turbidity (TSS) signal measured during scour events, and (3) demonstrate model performance over the long-term (the 1999-2012 period used for model calibration).

### **Specific Comments**

1. Section 2.1.3 Hydrodynamic Model, Page 9 First Paragraph: Include the contribution of the tide and estuarine circulation in addition to freshwater inflows from point source discharges in the study area.
2. Section 2.1.4 Sediment Transport Model, Page 12 First Complete Paragraph: Include the contribution of the solids transported by the tide and estuarine circulation in addition to the sediment loadings from point source discharges in the study area.
3. Figure G2-1, Hydrodynamic Model: The graphic only includes flow inputs from point sources and groundwater. Include the tide and estuarine circulation from the East River for completeness.
4. Figure G2-1, Sediment Transport Model: The model framework does not include waves or a bed consolidation algorithm. Although consolidation effects are implicitly included within the model framework by definition of erosion inputs and the fact that depositing sediments recreate the input bed profile of erosion properties, that is not the same as a traditional consolidation model that includes a time- and depth-dependent algorithm of dry density and erosion properties. Remove waves and consolidation from the graphic.
5. Figure G2-1, Sediment Transport Model: The graphic only includes solids loadings from point sources. Include East River solids loadings for completeness.
6. Figure G2-1, Sediment Transport Model: Include settling in the graphic.
7. Section 4.1 Model refinements Made During Phase 2

- a. Page 45, There is mention of a radiation separation approach method without any detail or reference. Based on this single sentence, it is difficult to understand how not using this method and applying a new method in Phase 2 helps to improve the model. Provide more information, as appropriate. Also, see Appendix G General Comment #9 in this regard.

## 8. Section 4.2 Analysis of Phase 1 and Phase 2 Hydrodynamic Data

- a. Page 45, Section 4.2.1 Water Surface Elevation Data. From the Figure, the report claims that only minor differences exist in in tidal amplitude and phase between the two gage locations. Include both in the same figure, and perform and include in revised text a tidal constituent analysis so that amplitudes and phases of the main constituents can be quantitatively compared.
- b. Page 47, Section 4.2.2. Referring to the 10-minute data set, the report mentions the effect of the subtidal oscillation, and the short-duration ebb and flood pulses with relatively large amplitudes during the point source discharge event on July 18. However, there is no mention of the double peaks in ebb and flood currents observed in the 3-hour Low-pass filter time series, and that are caused by the interaction of the New York Harbor and Long Island Sound tides. Expand the discussion of the various features in the data, and the processes/mechanisms responsible for said features.
- c. Page 47, Section 4.2.2 Current Velocity Data. The discussion in this section is focused on 1-week of data that is presented in Figures G4-6 to G4-8, and one single wet weather event. Current profile time-series data was collected for a total of 22 months (Phases 1 and 2) and therefore to limit the discussion on currents to 1 week of depth-averaged currents does not seem appropriate. It is also mentioned that data show a velocity pulse toward the East River and towards land, but there is no explanation of how the discharge generates this sort of back and forth movement of water. Add text/graphics discussing the estuarine circulation process, especially during large point source discharge events and expand the discussion as appropriate.
- d. Page 49, Section 4.2.3 Temperature and Salinity data. Only 3 months of salinity data are available from the continuous time series. The text indicates that based on the discrete salinity data, the overall salinity range is from 1 to 25 PSU. However, table G4-4 shows that the continuous 3-month data only has a range from 6 to 25 PSU, and the majority of the stations do not show values below 10-12 PSU. Revise the report to present an analysis of whether the range of the continuous 3-month salinity data is enough to characterize the conditions in Newtown Creek. It should be noted that only a handful of wet weather events were observed during this 3-month period; these events were also relatively small in terms of the total point source discharge.

Furthermore, a general summary is presented at the end of this section, but no analysis or detail is provided to support that notion the sets of data are appropriate with respect to having a synoptic understanding of the system using multiple parameters. The main limitation is the short salinity data set, with just a few small point source discharge events. It is doubtful if the salinity data provide enough information to understand the effect of the

point source discharges in Newtown Creek for the full range of expected discharge events. Elaborate on these issues in the text.

9. Section 4.2.1 Water Surface Elevation Data, Page 46, 2nd line. The sentence “Tidal motion ...” describes a complex tidal regime. This explains why extrapolating the tide from the Battery to the boundary on the other end of the East River is not a good approximation. Use the Lower Passaic River and Newark Bay Superfund or NYC LTCP regional model (or outputs from one of these same models) to specify the tide at the northern boundary; boundary conditions for temperature and salinity can also be specified using the outputs of the selected regional model.
10. Section 4.3 Specifications of Geometry and Bathymetry
  - a. Page 50, Section 4.3 The text indicates: *“As such, its boundaries are located 3 to 4 miles upstream and downstream of the mouth of Newtown Creek. It is common practice to set hydrodynamic model boundaries in tidal systems away from the area of interest, to ensure that the numerical methods used to specify inputs at model boundaries do not influence model predictions within the area of interest. That is, establishing the hydrodynamic boundary conditions at locations far from the mouth of the creek was necessary to provide accurate predictions of WSE and current velocity within the Study Area because the parameters are materially affected by circulation patterns and tidal dynamics in the East River”*. This sentence provides an explanation of why it is necessary to have the boundaries far enough to provide the correct circulation patterns and tidal dynamics in the East River. Although the locations of the boundaries might be considered far enough from this perspective, if data are not available to create the boundary conditions at one of the selected boundaries, a different location with sufficient data should have been chosen, to guarantee that the model is forced with the correct information. See Appendix G General Comment 1 for corrective actions.
  - b. Page 51, Section 4.3. The 2012 bathymetry was averaged into a single cell representative of the average. It cannot be determined if the model resolution is enough that it can maintain geomorphologically distinct features such as the relatively deep navigation channel and sub-tidal flats along the periphery, without losing this in the averaging process. Present a few cross sections in Newton Creek showing how the raw data is represented in the grid.
  - c. Page 51, Section 4.3. The report mentions a data gap in bathymetry. Discuss any implication on model results.
  - d. Page 51, Section 4.3. The report mentions that near the model boundaries, a constant depth was used to avoid numerical instabilities. Discuss if this is a limitation of the modeling platform, and if it is related to reflection at the boundaries.
11. Section 4.4 Specification of Model Initial and Boundary Conditions
  - a. Section 4.4.1. Initial Conditions, Page 52. The report notes that water temperature and salinity were held constant at the initial condition values for the entire 7-day spin-up period. It is unclear how holding the water temperature and salinity constant at both of the East River boundaries for the entire 7-day spin-up achieve a fully “spun-up” condition. It seems like this would generate an artificial condition in which the normal gradients in

salinity in the East River were not represented. Normally a hydrodynamic model that is applied to a partially stratified estuary is spun-up (using time varying salinity boundary conditions) for at least one month. Revise the model accordingly.

- b. Page 53, Section 4.4.2.1 Water Surface Elevation. The report indicates that “*NOAA tidal gauge data were not available at the northern boundary*”. It is correct that WSE data was not available for the full period simulated, but there is WSE data available at Horns Hook (the location of the northern boundary) from 2002 to 2005. These data were also used by NOAA to develop tidal constituents and therefore provide a means to predict the astronomical tide at this location, information that could have been used to generate tidal conditions at the northern boundary instead of a tidal variation based partly on data measured at the Battery. Revise the text to include mention of the WSE data at Horns Hook and why it was not considered for model development.
- c. Page 54, Section 4.4.2.1 Water Surface Elevation. Review of the data at the Battery and Horns Hook shows poor correlation between the subtidal fluctuations at these locations. On the other hand, subtidal fluctuations at Horns Hook show a close correlation with the subtidal fluctuations at Kings Point. This indicates that the subtidal fluctuation calculated at the Battery and used to calculate tide at the northern boundary is not correct. Use of a regional model results for tide at the northern boundary will address this issue. See Appendix G General Comment #1 for corrective actions.
- d. Section 4.4.2.1 Water Surface Elevation, Pg 54, 3rd paragraph. The report states that application of the Smagorinsky (1963) approach for calculating temporal and spatial variations in horizontal eddy viscosity and diffusivity made it possible to use the tidal harmonic method (the first option) for specifying WSE at the northern boundary and achieve numerical stability. Explain how the application of the Smagorinsky approach “made it possible to use the tidal harmonic method (the first option) for specifying WSE at the northern boundary and achieve numerical stability”.
- e. Page 54, Section 4.4.2.1 Water Surface Elevation. The text states: “*The amplitude multiplication factors and phase shifts listed in Table G4-11 were adjusted during calibration of the hydrodynamic model as discussed in Section 4.5.1*”. The standard practice for numerical model development and application considers model open boundary conditions to be independent of the model calibration process. Various US EPA (US EPA, 2009; US EPA 2010) and International (STOWA/RIZA 1999) guidance documents identifying the individual steps in the life cycle of model development and application consider the specification of boundary conditions a part of the model setup and input. Model calibration is a subsequent and separate process following definition of boundary conditions. See Appendix G General Comment #1 for corrective actions.
- f. Page 54, Section 4.4.2.1 Water Surface Elevation. The description of the different options for defining the boundary conditions is not clear in the report. Present more details for defining the boundary conditions to understand the issues of instability mentioned in the report.
- g. Page 54, Section 4.4.2.1 Water Surface Elevation. Text states: “*As discussed in Section 4.5.1 the WSE input at the northern boundary was adjusted during model calibration to improve*

*prediction of residual flow in the East River*". See comment 11.e above. It is not standard practice to calibrate boundary conditions.

- h. Page 55, Section 4.4.2.2 Temperature and Salinity. From the report: *"This assumption is valid because minimal temperature stratification is observed in the East River."* Describe and present what data were used to support this statement.
- i. Page 56, Section 4.4.3. Point Source Discharges. The water temperature specified for both discharges from the point source model and the WWTP effluent overflow is the same as for the East River boundary. The text indicates *"This assumption is appropriate because a diagnostic analysis showed that temperature variations in model boundary conditions had minimal effects on hydrodynamic model predictions (see Section 6)"*. However, the sensitivity analysis presented in section 6 uses the same temperature values at all the boundaries. A sensitivity analysis that evaluates the effect of the assuming the same temperature for the point sources, WWTP effluents and the East river is not presented. Support the assumption that the temperature of the effluents should be the same as the East River water.
- j. Page 57, Section 4.4.4. See comment 11; review and address as appropriate.

## 12. Section 4.5 Calibration Approach and Results

- a. Page 59, Section 4.5.1 Calibration Data and Approach. The text mentions the calibration of the boundary: *"The astronomical tide conversion factors used to transform tidal data at the Battery to the northern boundary were adjusted during the calibration process"*. See comment 11 regarding the appropriateness of this approach and Appendix G General Comment #1 for corrective actions.
- b. Page 60, Section 4.5.1 Calibration Data and Approach. Describe the metrics that were examined in reaching the conclusion that the model is insensitive to effective bed roughness.
- c. Page 60, Section 4.5.1 Calibration Data and Approach. The text mentions that the adjustable parameter (AHD) in the Smagorinsky equation is dependent on the spatial resolution of the numerical grid. However, this value has been defined spatially variable from the entrance to the end of the creek, while grid resolution is similar. Explain this inconsistency.
- d. Page 62, Section 4.5.3.1 Calibration Results-Water Surface Elevation. The shape of the tide during ebb and flood is not correctly simulated because of the northern boundary. In addition, the subtidal elevation fluctuation at the northern boundary is not correct and can introduce errors. The evaluation of model performance, using bias and ubRMSD, especially for water levels is very limited by methodology. The model could show a small bias error and ubRMSE when long time series are compared (like averaging the error for all conditions), but have significant errors for the conditions that contribute most to the important fate and transport processes in the system. In tidal systems, the assessment of model performance involves examining how the simulated tidal constituents (amplitude and phase) compare to observed values. In addition, performance during events or conditions that are relevant for the project (point source discharge events, surges, etc.)

should also be evaluated. Include and discuss an assessment of model performance by comparing model and data for the amplitude and phase of the major tidal constituents.

- e. Page 62. Section 4.5.3.2 Calibration Results-Residual Flow in the East River. This section indicates that the northern boundary condition was adjusted to simulate the average residual flows in the East River (see comment 11 regarding calibration by adjusting the boundary condition). In addition, the target values for the residual flow have a large range. Therefore, the calibration target selected for the model is unclear. It is also not clear why/how important residual flow in the East River is for the project. The report does not present an evaluation of the importance of reproducing the residual flow versus reproducing the instantaneous ebb and flood velocities in the East river which are more relevant to features such as residence time within the model domain. Include a review of instantaneous currents calculated by the model in the East River over a typical spring-neap cycle relative to NOAA measurements.

### 13. Section 4.5.3.3. Current Velocity

- a. Page 65. Section 4.5.3.3.1 Depth-Averaged Current Velocity. There are approximately 21 months of velocity data. The report discusses the evaluation of how the model reproduces the effect of a precipitation event for one case and the report indicates that the model has a relatively good agreement for that event. Expand this discussion to include other conditions, e.g., dry-weather performance, spring-neap performance, etc.
- b. Page 65. Section 4.5.3.3.1 Depth-Averaged Current Velocity. The report presents some global results clustering all the data for all the stations, for example saying that for 10 minute results the ubRMSD is approximately 0.1 ft/s. Tables G-17 to G-27 present the ubRMSD by location and deployment. For example, at NC086CM the ubRMSD is approximately 0.22 ft/s and this value is reduced towards land to values of 0.05 ft/s at EK023CM. At the same time that the ubRMSD reduces toward land, the amplitude of the velocities is reduced too. It is important to understand the relative error with respect to the range of values at each location. An ubRMSD of 0.1 might be small at the Newtown Creek entrance, but large towards land. The model/data comparison for currents should include a description of the error at each station including the relative error. Revise the report accordingly.
- c. Page 65. Section 4.5.3.3.1 Depth-Averaged Current Velocity. This section does not mention the difference between the simulated and measured currents using the 3-hour low pass filter. The model cannot reproduce the double peak in ebb and flood, which is a consequence of the way the northern boundary has been defined. Revise the text to include a discussion of the features in the data reproduced/not reproduced by the model.
- d. Page 66. Section 4.5.3.3.2 Vertical Profile of Current Velocity. Similar to the depth averaged currents, the double peak in ebb and flood is not reproduced by the model . Revise the text to include a discussion of the features in the data reproduced/not reproduced by the model.
- e. Page 66. Section 4.5.3.3.2 Vertical Profile of Current Velocity. This section discusses some of the figures in a very general way and some observations from the figures are not mentioned. For example, in Figure G.59 and 60 at NC315 the model seems to overpredict at

the surface towards the East River and at the bottom towards land. On the other hand, the text says: “*results indicate that near-surface velocity is overpredicted and near-bottom velocity is underpredicted*”. Conclusions of the validity of the results are not made station by station but by averaging and clustering all the stations together. For example: “*the differences in the predicted and observed vertical profiles of velocity are relatively small; on average near-surface velocities are overpredicted by 0.03 ft/s and near-bottom velocities under-predicted by 0.03 ft/s*”. These values might look small when multiple stations are lumped together but the conclusions could be different if the error at each station is evaluated relative to the amplitude at that station. Revise the text to include (1) a discussion of the features in the data reproduced/not reproduced by the model, (2) a discussion of model performance (including quantitative comparisons) during dry-weather and large wet-weather periods, and (3) model/data comparison for currents using a description of the error at each station including the relative error.

- f. Page 67. Section 4.5.3.3.2 Vertical Profile of Current Velocity. The model performance has not been evaluated independently for wet weather and dry weather. On the contrary, statistics are only presented for the complete time series and in the text for all the stations together. The performance of the model during the wet weather events is very important, and it is important to evaluate the model performance for those specific periods. Include an assessment (both qualitative and quantitative) of model performance separately during dry-weather and wet-weather conditions.
- g. Page 67. Section 4.5.3.3.2 Vertical Profile of Current Velocity. The report mentions that the model correctly simulates the temporal variation of the currents during a neap-spring cycle. However, the preceding text does not present a discussion of this feature. Include a description of model performance over the time-scale of a spring-neap cycle.
- h. Page 67. Section 4.5.3.3.2 Vertical Profile of Current Velocity. As previously mentioned the parameters used to quantify the model performance (bias and ubRMSD) are calculated for all the depths, all the stations and all the conditions as a single average value. This is not representative of how the model represents different processes. For example, the model could do a good job under normal tidal conditions that are representative of the majority of the time. However, during short-lasting events (e.g., point source discharges, storm surges, etc.), the model may not perform well. In this case, error statistics might be satisfactory, while the model does a poor job reproducing short-term fate and transport which could be important and/or relevant to sediment and contaminant fate and transport. Conduct the model performance evaluation and error calculation with respect to specific processes and types of environmental conditions.

#### 14. Section 4.5.3.4. Temperature

- a. Page 67. Section 4.5.3.4 Temperature. It is difficult to conclude from the figures that the larger diurnal temperature fluctuations in the near-surface layer are captured by the model. Revise as appropriate.
- b. Page 68. Section 4.5.3.4 Temperature. This is the first reference in the document to a distinction between dry and wet weather conditions in evaluating model performance.

However, there is no explanation on how these conditions have been developed or what they represent. Based on Tables G4-39 through G4-52, wet periods include periods lasting from a few days to almost a month. However, there is no information in the report regarding how these possible periods were selected. Revise the text to include an explanation on how these conditions have been developed or what they represent.

#### 15. Section 4.5.3.5. Salinity

- a. Page 68. Section 4.5.3.5 Salinity. The report states: *“Salinity data collected at the bulkhead sondes are more useful than the salinity downcasts for evaluating model performance because bulkhead sonde data are continuous measurements whereas downcast data are instantaneous measurements”*. However, there are only 3 months of data available from the bulkhead sondes and it does not coincide with the period when other variables (water levels, currents, turbidity) were collected. Therefore, most of the model performance analysis and system understanding regarding salinity will have to be performed based on downcast data. Explain if/how the limited amount of salinity data are sufficient for the project.
  - i. Page 69. Section 4.5.3.5 Salinity. The available bulkhead data period (July 9 to October 9, 2015) includes two of the driest months of the year, August and September. The model performance during point source discharge events was evaluated for the limited number of events that occurred during this period. The largest events during this period (obtained from figures G-D 146 to G-D-181, note that values in figures G4-81 to G4-86 are in MG/hr) were approximately 70 MG/event, while the annual maximum point source event is in the order of 400 MG/event (from Figures G-D 85 to G-D 134 annual maximum point source event is ~400 MG but it varies from 200 MG for 2012 to 700 MG in 2011). This implies that the 3-month period of available continuous salinity data do not seem appropriate to evaluate the model performance during large wet-weather events. Include a discussion of the available salinity time-series data relative to the environmental conditions in the Creek and whether the salinity time-series data can be considered appropriate for an evaluation of model performance during large wet-weather events.
  - ii. Page 69. Section 4.5.3.5 Salinity. Elaborate on why stratification factor was not used for the bulkhead data time series.
  - iii. Page 70. Section 4.5.3.5 Salinity. The report states: *“The results discussed above show that the hydrodynamic model simulates salinity with sufficient accuracy to meet the objectives of this study because predicted salinity has minimal bias (typically less than 1 psu) and low ubRMSD (typically less than 1 psu)”*. These error statistics, as for other variables, are presented as a global average without separating the performance for different types of conditions that might be more relevant for the project. In this regard the report says: *“model tends to underpredict salinity stratification during wet weather events”*. Considering these events are important from the perspective of fate and transport of point source sediment loadings, clarify the importance of the fact that the model does not perform well during these events to meet the objectives of the study. Figures G-D 146 to G-D-181 present the comparison of model predictions to the continuous data from the sondes (July to October 2015). In general, the model consistently underpredicts the variation in surface salinity for most of the point source discharge events, and more clearly for the largest events. These events are important for the transport of point source solids loadings and it is during these

- events that the model discrepancies with the observations are the largest. Revise the text to include (1) a discussion of model performance (including quantitative comparisons) during dry-weather and wet-weather periods, and statistical comparison using a description of the error at each station.
- iv. Page 71. Section 4.5.3.5 Salinity. The report indicates a number of factors that affect uncertainty in model predictions, but does not present or refer to any analysis that has been done to confirm these as the sources of uncertainty. The horizontal and vertical diffusion were part of the calibration process, probably focused on obtaining the right salinity stratification in Newtown Creek. Elaborate on these factors.

## 16. Section 4.6 Conclusions

- a. Page 71. Section 4.6.1. Overall Hydrodynamic Model Performance. Revise this subsection to clarify the meaning of the following phrase: *“...analysis of predicted WSE versus measured current velocity, salinity and temperature...”*
- b. Page 72. Section 4.6.1. Hydrodynamic Model Performance: Water Surface Elevation. As explained in previous comments the predicted WSE are not correct because of the previously described issues with the norther boundary condition for tide. In addition, the text says: *“minimal errors in predicted tidal amplitudes and phase”*. Compare tidal constituent amplitudes and phases from the model and the data to evaluate this claim. The text does not present any information besides a few time series plots of water levels that can be used to confirm the claim. See Section 4.5 Comments for corrective actions.
- c. Page 72. Section 4.6.2. Hydrodynamic Model Performance: Current Velocity. There is no qualitative or quantitative analysis that demonstrates that the spring-neap variation in currents is well simulated beyond some time series plots, nor does the text include a discussion about it. The estimated errors in current velocities are presented as one single number for all the vertical layers, all the stations and all the periods (dry or wet). The model performance needs to be evaluated by station and with errors relative to the amplitude of the variable at each station and during different periods. A global ubRMSD of 0.15 ft/s seems high – at the mouth of the creek, current amplitudes are in the order of 0.5 ft/s, indicating a relative error of 30%. However, upstream, the amplitudes are much smaller making this ubRMSD value much more concerning. See Section 4.5 Comments for corrective actions.
- d. Page 72. Section 4.6.3. Hydrodynamic Model Performance: Temperature. As with other variables only one single value averaged over the whole domain and simulated period is presented to discuss the model performance. The report does not present any analysis of uncertainty during discharge events nor any evaluation to assess if the assumption of using the temperature of the discharge the same as the water temperature at the East River is a valid assumption. The model performance during the specific environmental conditions (e.g., point source discharges, dry-weather conditions, storm surges, etc.) should be assessed in detail. See Section 4.5 Comments for corrective actions.
- e. Page 73. Section 4.6.4. Hydrodynamic Model Performance: Salinity. The model underpredicts salinity stratification during wet weather events. These are important periods for point source sediment loadings; however, this is also when the model

performance is relatively worse. The lack of continuous data is also a problem for the salinity calibration because the model data comparison is limited to just a few events during the driest months of the year. See Section 4.5 Comments for corrective actions.

#### 17. Section 5.2.1 Multiple Lines-of-Evidence Approach for Evaluating Net Sedimentation Rates

- a. Page 76, Third Bullet in First Paragraph: Sediment traps give information on the gross sedimentation mass flux (in units of mass/area/time), whereas NSRs represent the net sedimentation rate (in unit of length/time). Furthermore, the latter include the effect of spatial variations in dry density in the bed whereas the former do not. Sediment traps are also designed to “trap” suspended sediment that may not be deposited onto the sediment bed. Therefore, due to these reasons sediment trap data cannot be used to develop NSRs as mentioned in the first sentence of this paragraph. They can, however, be used as indicative and qualitative evidence on the sedimentation process, as is described in the fourth paragraph on page 77. Clarify/qualify the use of sediment trap data in the context of the discussion in this section.
- b. Page 76, Fourth Bullet in First Paragraph: Vertical profiles of contaminant concentrations in the sediment bed are mentioned as an approach to develop NSRs. However, subsequent text in Appendix G does not include any mention of this approach. Delete this bullet or add text describing this approach and the results of such analyses.
- c. Page 76, Third Paragraph: As mentioned in the text, although uncertainty in data-based NSRs has been included in the analyses, the potential for bias in any of the individual datasets has not been explored. For example, USACE performance metrics for hydrographic surveys (USACE, 2013) allow for 0.3 ft bias in bathymetric survey data. The resulting error introduced (0.7 cm/yr over 1999-2012, assuming a bias of 0.3 ft in the 1999 data and no bias in 2012) is within the range of sedimentation rates noted in some of the tributaries over this time period (for instance, see the area-Average NSRs in Table G-H-1). One approach to evaluate bias is to compare multiple lines of evidence and check for consistency between the various datasets. In this case, NSRs have been calculated based on geochronology cores, bathymetric differencing over various periods, and historical dredging records. Perform a comparative analysis of NSRs from various approaches and an assessment of the potential for bias in any of the individual NSR approaches. See comments to Attachment G-H for an example of such an analysis for English Kills which indicates a potential bias in the 1999 bathymetry dataset.
- d. Page 76, First and Second Bullets in Fourth Paragraph and associated Figures G5-5 and G5-6: Despite the availability of 1999 bathymetry in Dutch Kills, it has not been referenced in the text or used in the 1999-2012 or 1999-2011 bathymetric differencing. Either (1) include Dutch Kills in these analyses, or (2) provide justification as to why Dutch Kills is being excluded.
- e. Page 76, Third Bullet in Fourth Paragraph: Modify this statement to mention that NSRs were not calculated over the entire area of the East Branch due to partial coverage in 1991.

- f. Page 77, Second Paragraph, Bulleted List: Add text discussing the insights regarding historical changes in NSRs and point source sediment loadings resulting from the analysis of NSRs from geochronology cores.
- g. Figures G5-5 and G5-6: Either (1) include NSR from historical dredging in English Kills, or (2) provide justification for excluding these NSR estimates.
- h. Page 78, Third Bullet in List Continuing from Page 77: Clarify if the temporal variability noted in the gross deposition rates from sediment traps correlate with potential factors such as seasonality in East River TSS concentrations, point source discharge events, storm surges, etc.
- i. Page 78, First Complete Paragraph: Some of the insights regarding sediment transport processes have been introduced without presentation of adequate analysis and discussion up to this point in the text. Specific instances are listed below:
  - v. The relative distribution of East River and point source loadings
  - vi. Impact of propwash resuspension
  - vii. Temporal changes in sediment loadings from CSOs
 These are potentially important physical processes at the Site. Provide analyses and discussion to support each of these insights in the various portions of the study area.

#### 18. Section 5.2.2 Data-Based Mass Balance Analysis

- a. Page 78, First Paragraph and Equation G-8: There is an *a priori* assumption that no sediment originating from the East River and the Main Stem deposits in the tributaries. This assumption is not discussed in the text. As such, Equation G-8 is missing a term on the right-hand side of the equation representing the net deposition in the tributary of solids originating from the East River and the Main Stem. Either list this assumption and suitable justification, or include the potential for deposition of solids originating from the East River and the Main Stem. The latter alternative can be implemented by replacing term  $L_{PS}$  in Equation G-8 with  $L_{ER+PS}$ , where  $L_{ER+PS}$  represents some unknown combination of solids originating from East River (including Main Stem) and point source loadings. Revise the text accordingly.
- b. Page 79, Second Bullet in First Paragraph: Insight regarding the magnitude and composition of point source sediment loadings can be achieved only if assuming no deposition of solids originating from the East River and the Main Stem. If the deposition of solids originating from the East River and the Main Stem is also considered, then no definitive statements can be made on the magnitude and composition of point source loadings. Revise the text by either (1) mentioning that insights about the magnitude and composition of point source sediment loadings can be achieved only under the limiting assumption that no solids from the East River and Main Stem are deposited in the tributaries, or (2) delete this bullet.
- c. Page 79, Bulletized list in First Paragraph: While the first bullet is addressed in the results of the analysis (subject to its current assumptions), the goals described in the second and third bullets are not addressed subsequently. Review and revise accordingly.

- d. Page 79, Third Paragraph: The last sentence in this paragraph says "*Dutch Kills was not included in this analysis because sufficient bathymetry data were not available*". However, this is contrary to what is described in the following paragraph, that the inputs to this analysis are the USEPA calibration target NSRs. These NSRs are defined in Table G5-8, and include values for Dutch Kills as well. Revise the analysis and text to include Dutch Kills.
- e. Table G5-8. Revise the title of third column to "Upper-Bound ...".
- f. Page 79, Fourth Paragraph and Figure G5-9: The text and the figure include the statement "*More than 90% of tributary deposition is due to point source sediment loads*". However, there is no text or arguments provided to support and justify this statement. Revise the text and include supporting evidence.
- g. Page 80, Equation G-10: The equation for trapping efficiency neglects net deposition in the tributary of solids originating from the East River and the Main Stem. Either list this assumption and suitable justification, or include deposition of solids originating from the East River and the Main Stem. The latter alternative can be implemented by replacing term  $L_{PS}$  in Equation G-10 with  $L_{ER+PS}$ , where  $L_{ER+PS}$  represents some unknown combination of solids originating from East River (including Main Stem) and point source loadings. Revise the text accordingly.
- h. Page 80-81, Last Paragraph Starting on Page 80 and Figure G5-13: The calculations presented in this section assume that point sources are the sole source of depositing sediments to the tributaries. This is an unsupported assumption. For the example of English Kills presented in Figure G5-13, using average tidal range of 1.5 m, area of 94,500 m<sup>2</sup>, and a nominal 10 mg/L of TSS gives gross annual solids load of ~1000 MT/yr imported from the Main Stem during the flood phase of the tide (with unknown export during the ebb phase of the tide), a number in excess of even the upper uncertainty bound (910 MT/yr) in Figure G5-13. The potential for deposition of this load from downstream (from the main stem) is not considered in the mass balance calculations. Rather, the statement "*Valid Assumption: Sediment loads from downstream sources have relatively minor effect*" is made in Figure G5-13 without any supporting evidence. Either list this assumption and suitable justification, or consider the potential for deposition of solids originating from the East River and the Main Stem. Revise the text accordingly.
- i. Page 80-81, Last Paragraph Starting on Page 80, continuing to Page 81, and Bullet List on Page 81: The results of the sediment mass balance analysis do not seem to be referenced anywhere else in the text. How have the results of this analysis been used subsequently? Either (1) refer to this analysis in a following section, or (2) delete this section.

#### 19. Section 5.2.3 Bed Property Data

- a. Pg 81. Revise the report to describe what causes the bed composition to become coarser moving upstream from the East River (it is also generally coarser in the tributaries)
- b. Page 81, First Complete Paragraph: The reference to fluid mud is made rather abruptly at the end of the paragraph and without any context. Is the assertion that fluid mud is present

in areas upstream of CM 1 where on average, dry density is less than 0.4 gm/cm<sup>3</sup>? Clarify the text.

- c. Page 81, Second Paragraph: There is large variability in the fines content within the main stem and the tributaries. For instance, as seen in Figure G5-22, fines content ranges from ~15-100% between CM 0-1. Is this spatial heterogeneity related to features such as point source release location or other factors such as the flow characteristics of the water body? In relative terms, point source loadings are comprised of more sands (~40-50% as per Table G5-6) than East River loadings (2% as per Section 5.4.1). Assuming that sands are deposited in the proximity of the outfalls, this could potentially explain the spatial variability in fines content. The spatial heterogeneity of fines content could be relevant to the contaminant fate and transport modeling efforts since contaminants typically partition to organic carbon-rich fine sediments more than sands. If so, it may be of use in refining the model initial conditions. Review the data and clarify if the heterogeneity can be explained by afore-mentioned factors, and incorporate into the model as appropriate.

#### 20. Section 5.2.4 TSS Concentration and Turbidity Data

- a. Page 82, First Paragraph: Clarify the conclusion from Figure G5-28 – is there or is there no temporal trend in TSS at the mouth of the Creek?
- b. Page 82, Second Paragraph: See comments on Attachment G-F. There is a correlation between turbidity and TSS, primarily dependent on environmental conditions (dry-weather versus large wet-weather events). The resulting turbidity-TSS relationships can be used to develop TSS time-series. The TSS time-series can be used to calibrate the sediment transport model during dry-weather and large wet-weather event conditions which represents two bounding conditions for sediment transport. Revise the text and figures to (1) include a discussion of the turbidity-TSS correlations, (2) develop estimates of TSS time-series from the measured turbidity, (3) use the resulting TSS time-series in developing an understanding of sediment transport within Newtown Creek (for instance, dry-weather versus wet-weather conditions), and (4) use the TSS time-series estimates as a model calibration metric.

#### 21. Section 5.3.1 Sediment Size Class Characteristics

- a. Page 84, First Paragraph: The choice of the number and type of sediment size classes (how many cohesive classes, and how many non-cohesive classes), is typically made based on site-specific factors such as the sediment substrate, analysis of TSS time-series data, etc. However, the text does not currently provide such explanation. Explain the rationale and provide evidence supporting the choice of sediment classes included in the model.
- b. Page 84, First Paragraph: A row of cells across the mouth of Newtown Creek (I=12) appears to have been defined as hard-bottom even though these seem to be partly within the boundary of the Study Area. Review and revise as appropriate.
- c. Page 84, Third Paragraph: The selection of particle diameters for class 2 and class 3 (fine sand and medium-coarse sand, respectively) seems to have followed different procedures. Class 2 particle diameter was determined based on an assumed settling velocity. In contrast,

Class 3 particle diameter was first assumed and a corresponding settling velocity calculated. However, neither of these particle diameters are data-based, i.e., based on an analysis of the grain size distribution within Newtown Creek. Given the relevance of particle diameters on the erosion, armoring, and hiding/exposure functions inherent in the active-layer formulations of SEDZLJ as well as settling velocity, the particle diameter inputs should be based on an analysis of bed grain size distribution measured within Newtown Creek. Particle diameter is the fundamental sediment property from which other characteristics such as settling velocity and erosion-behavior (via the critical shear stress for erosion, armoring, and hiding/exposure, etc.) are derived. There are many methods for calculating a representative particle diameter for given size class. One approach would be to calculate the median diameter within a size class (e.g. between 63 -250  $\mu\text{m}$ ) for a given core, and then calculate an average diameter for all the cores within Newtown Creek and use for model input. Finally, settling velocity should be calculated based on particle diameter, not the other way around. Revise the model inputs and text accordingly.

#### 22. Section 5.3.3.1 East River

- a. Page 88, Last Paragraph: Clarify what the conclusion is from the temporal trends in TSS shown in Figure G5-36. The data seem to indicate a seasonal trend, declining through summer and fall before increasing in the winter and spring, a seasonality similar to freshwater flow in the Hudson River.
- b. Page 89, First Sentence: A vertically constant profile of TSS was applied at the East River boundaries. Do the data used to develop the boundary conditions (data near the mouth of Newtown Creek) show any vertical gradients in TSS? Such gradients are typical of fine sediments, and in combination with estuarine circulation can result in net upstream flux of fine sediments. If the data show vertical gradients, then apply such a gradient the East River boundaries.

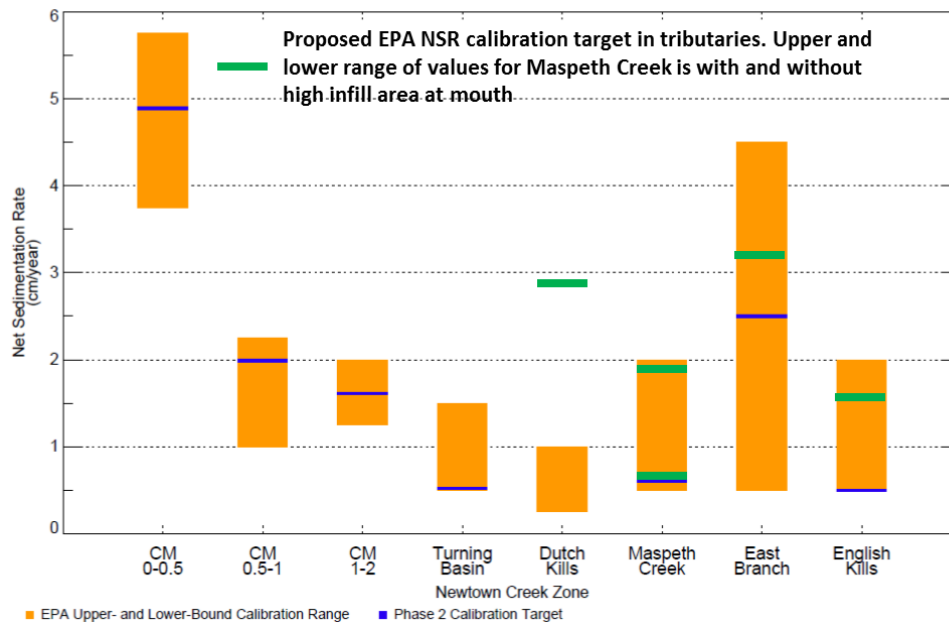
#### 23. Section 5.3.3.2 Point Source Discharges

- a. Page 90, Last Paragraph: Relate the analysis described in this paragraph to the remainder of the text in this section.
- b. Page 91, Third Paragraph: Explain why no wash-load fractions are assumed to be associated with point source discharges.

#### 24. Section 5.4.1 Calibration and Validation Approach

- a. Page 94, First Complete Paragraph and Figure G5-45: Reconcile the text in this paragraph with Figure G5-45. The text indicates that NSRs were the only calibration target, with the other metrics listed in Table G5-7 used for model validation. Figure G5-45 makes no such distinction; instead it indicates that all the metrics listed in Table G5-7 were used for model calibration.
- b. Table G5-8: The third column is mislabeled as "Lower-Bound..."; it should be "Upper-Bound...". Revise accordingly.

- c. Page 94, Second Paragraph, Figure G5-46, and Table G5-9: Explain the rationale behind the choice of NSR calibration targets using different approaches in various portions of the study area. The NSR calibration targets appear to have been defined using a number of somewhat inconsistent approaches. For instance, NSR calibration targets in the main stem were defined using 1991-2012 bathymetric differencing, East Branch and Maspeth Creek using 1999-2012 bathymetric differencing, and English Kills using the lower bound of USEPA-proposed NSR ranges despite the availability of 1999-2012 bathymetric differencing. In addition, explain why a NSR calibration target is not defined for Dutch Kills despite the availability of 1999 bathymetry data as well as USEPA-proposed NSR ranges.
- d. Page 94, Second Paragraph, Figure G5-46, and Table G5-9: As mentioned in the comments to Attachment G-H, the 1999 bathymetry data may likely be biased in English Kills and the East Branch and therefore unsuitable to establish NSR calibration metrics. In contrast, the 1991-2012 NSR is consistent with the other lines of evidence for NSRs in these tributaries. Within Maspeth Creek, barring an area of high sedimentation near the mouth (Area 2 in Table G-H-3), the 1991-2012 and 1999-2012 bathymetric differencing produce relatively similar NSRs as other lines of evidence. Therefore, it is appropriate to use the 1991-2012 bathymetric differencing to define calibration targets in Maspeth Creek (primarily for portions away from the mouth; NSRs shown in Table G-H-3), resulting in calibration targets within the USEPA NSR ranges for this tributary. Finally, in Dutch Kills, which was not covered in the 1991 survey, the 1999-2012 bathymetric differencing indicates NSRs relatively similar to other lines of evidence (adjusted for uncertainty in Pb-210 NSRs). However, the NSR calibration target calculated using the 1999-2012 bathymetric differencing is higher than the upper bound of the USEPA NSR ranges for this tributary. Figure 1 shows a graphical comparison of the USEPA NSR ranges, the FMRM NSR calibration targets, and proposed EPA NSR calibration targets. The proposed revisions to the NSR calibration targets also represents a more consistent use of datasets than the approach in the FMRM which uses 1999-2012 bathymetric differencing in two tributaries, the lower bound from USEPA's NSR ranges in another tributary, and no calibration target in the fourth tributary. The proposed approach relies on the 1991-2012 bathymetric differencing in three tributaries, using the 1999-2012 bathymetric differencing in the fourth tributary solely due to a lack of bathymetric coverage in 1991. Furthermore, the proposed NSR calibration targets are also consistent with the NSRs from other lines of evidence. Perform a comparative analysis of NSRs from multiple lines of evidence as a data quality check on the NSRs from individual approaches, and develop a consistent approach for defining NSR calibration targets in the various tributaries.



**Figure 1 USEPA NSR ranges, FMRM NSR calibration targets, and proposed NSR calibration targets. Note, proposed EPA NSR calibration targets may differ from NCG analysis presented in Attachment G-H due to differences in analytical methodology.**

This analysis for reconciling NSRs from various lines of evidence suggests that the 1991-2012 bathymetric differencing is appropriate to define NSR calibration targets in English Kills, East Branch, and Maspeth Creek. The resulting NSR calibration targets are also within the USEPA NSR ranges for these tributaries. Within Dutch Kills, due to the lack of bathymetry data from 1991 and because the 1999-2012 NSRs are consistent with other lines of evidence, the 1999-2012 bathymetric differencing is appropriate to define NSR calibration targets. However, the resulting NSR calibration target is higher than the upper bound in USEPA's NSR range for this tributary. The proposed revisions to the NSR calibration targets for these tributaries also represents a more consistent use of datasets than the approach in the FMRM which uses 1999-2012 bathymetric differencing in two tributaries, the lower bound from USEPA's NSR ranges in another tributary, and no calibration target in the fourth tributary. The proposed approach relies on the 1991-2012 bathymetric differencing in three tributaries, using the 1999-2012 bathymetric differencing in the fourth tributary solely due to a lack of bathymetric coverage in 1991.

- e. Page 94, Third and Fourth Paragraphs: A number of inputs and parameters were adjusted as part of model calibration:
  - i. Model inputs
    - 1) East River wash load content
    - 2) East River flocculated clays/silt content
    - 3) East River fine sand content
  - ii. Model parameters
  - iii. East River flocculated clays/silt settling velocity

iv. Point source flocculated clays/silt settling velocity

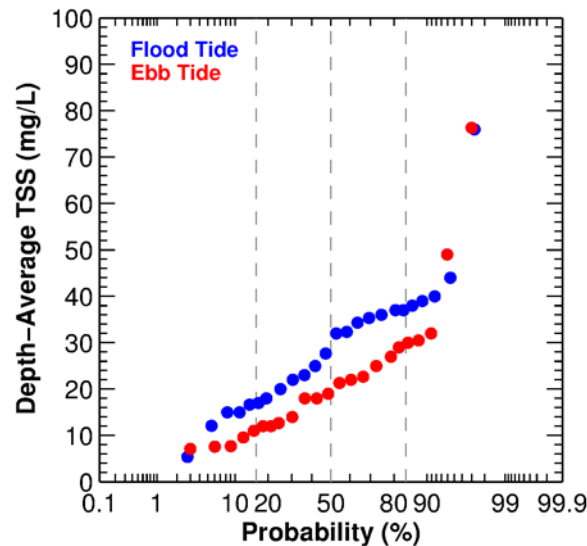
In addition, the settling velocity of wash load is an assumed value. Because it is not based on site-specific data, it is not a truly independent parameter. In other words, a different settling velocity assumption could require a different East River wash load content to reproduce the performance obtained with the FMRM parameterization. A similar argument exists with respect to the settling velocity and East River content for the flocculated clays/silts as well, where an increase in settling velocity could potentially be compensated by a decrease in East River content for this size class. In other words, the large number of inter-dependent model assumptions, and model inputs/parameters subject to calibration indicates the potential for non-unique input and parameter combinations which in turn reduces confidence in model predictability and performance. Develop an approach that can help reduce the number of model inputs and parameters subject to assumption and/or calibration.

- f. Page 94, Third and Fourth Paragraphs: Inputs such as the mass fractions of the three size classes in East River suspended sediments, essentially the boundary conditions, should not be subject to calibration. According to guidance from USEPA (2009, 2010) and others (STOWA/RIZA, 1999), in the process cycle of model application for a given site, model inputs such as boundary conditions should be defined separately from and prior to the process of model calibration. The process of model calibration should focus on model parameters such as settling velocity rather than boundary conditions. Therefore, model inputs such as the mass fractions in East River loadings should be determined either on the basis of measurements, or on the basis of suitable data analysis. Develop data-based and/or empirical approaches to constrain the sediment mass fractions in the East River loadings. See the following comment for additional suggestions in this regard.
- g. Page 94, Third and Fourth Paragraphs: EPA recommends measurements of grain size distribution in the East River loadings (perhaps as part of future sampling) which will help constrain these model inputs. In the interim, given the lack of such data, there are potential analytical approaches that may help estimate the composition of East River loadings. The sand content of East River loadings may potentially be calculated based on a sediment mass balance. Assuming sands transported from the East River are deposited within CM 0-2 (this length corresponds to the tidal excursion length for a particle located at the mouth of Newtown Creek at the beginning of the spring flood tide), the likely sand loading from East River can be calculated as follows:

East River sand content (mass/volume) = [(measured sand content in the sediment bed between CM 0-2 \* dry density \* NSR \* bed area) – (estimated annual point source sand loadings between CM 0-2)] / [Tidal Prism of entire Newtown Creek at average tidal range \* Number of tides/yr]

The relative distribution of the flocculated clays/silts and wash load fractions can potentially be determined by reviewing available data – for instance, as shown in Figure 2, median depth-average TSS concentrations during the flood and ebb phases of the tide correspond to approximately 30 mg/L and 20 mg/L, respectively, in the vicinity of CM 0.25.

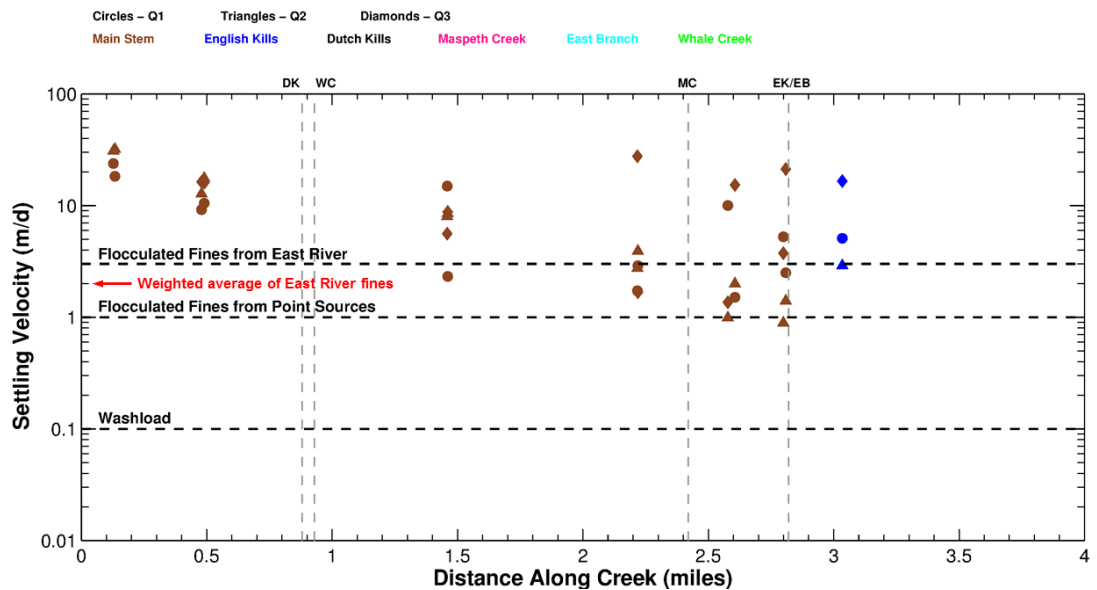
This relative difference between flood and ebb provides an approximate idea of the relative proportions of the fast-settling and slow-settling classes.



**Figure 2. Probabilistic comparison of depth-average TSS measurements during flood and during ebb using measurements during Phase 1 and Phase 2. Data from the vicinity of CM ~0.25**

- h. Page 94, Fourth Paragraph: Elaborate on the rationale and basis for the difference in settling velocity of flocculated clays/silts from East River and from point sources, at 3 and 1 m/d, respectively.
- i. Page 94, Fourth Paragraph: The calibrated settling velocity for the flocculated clays/silts from East River and from point sources at 3 and 1 m/d are about 10X too low compared to estimates from within Newtown Creek and compared to other studies of NY harbor (LBG et al., 2014; HydroQual, 2007; Ralston et al., 2013; Fugate and Chant, 2006). In particular, Fugate and Chant (2006), sampling the CSO plume from an outfall in Flushing Bay, NY, estimated settling velocity for CSO solids ranging from 43 m/d to 800 m/d, with a median value of 250 m/d. The sediment transport model developed by Moffatt & Nichol and Deltares for the Lower Passaic River and Newark Bay Superfund sites (currently under final review by US EPA Region 2) also uses fine sediment settling velocities up to an order of magnitude higher than used in the FMRM. In addition, site-specific estimates within Newtown Creek have been derived using the gross sedimentation rates measured in the sediment traps (data shown in Figure G5-7). These data were paired with the fines content measured for the sediment accumulated in these traps, median near-bottom TSS from Phase 1 and Phase 2 measurements in the vicinity of the traps, and an average spring-neap probability of deposition at the trap locations (assuming critical shear stress for deposition of 1 dyne/cm<sup>2</sup> and the Krone formulation for probability of deposition). The calculations were performed for various locations along the main stem and a location within lower English Kills. Since the sediment traps measure gross sedimentation rates, the settling velocity estimated using this approach is an estimate of the gross settling velocity, a number directly comparable to model inputs for this parameter. Figure 3 shows the results of this analysis in comparison to model inputs (horizontal dashed lines). The comparison shows

that barring a few instances in the vicinity of the Turning Basin, the majority of the estimated settling velocity values are higher (up to 10X) than model inputs for flocculated fines from East River as well as point sources.



**Figure 3. Spatial profile of settling velocity estimated from sediment trap data at selected locations relative to model inputs for settling velocity.**

Reconcile model inputs for settling velocities with these site-specific estimates.

#### 25. Section 5.4.2.1 Model Calibration: NSRs for 1999 to 2012

- a. Page 95, Third Paragraph: In addition to the area-average NSR, include a probabilistic comparison of NSRs from bathymetric differencing averaged over the scale of model grid cells, and model-calculated NSRs. The comparisons can be over the same reaches as used in Figures G5-47 through G5-49. This will allow for an assessment of how well the model captures the spatial variations in NSRs within individual reaches.
- b. Pg 95, Last paragraph. Deviations between predicted and data-based NSRs are most likely due to more than just the “uncertainty in the magnitude and composition of point source sediment loads for these two tributaries”. Revise the report to include additional evaluations of the source of the observed deviations between predicted and data based NSRs
- c. Page 96, First Paragraph: Include a spatial (map) comparison of NSRs over the scale of individual model cells (using 1991-2012, and 1999-2012 bathymetric differencing, as appropriate) and model results. This will allow for an assessment of the spatial pattern of NSRs and how well the model performs relative to data.
- d. Page 96, Second Paragraph: What is purpose behind comparing parallel and continuous simulations? Will parallel simulations be performed in the future or is the continuous

simulation approach the preferred approach for the FS simulations? Provide clarifying text to address the questions and, if the latter, delete this paragraph and associated figure.

#### 26. Section 5.4.2.2 Model Calibration: NSRs for 1999 to 2012

- a. Page 96, Fourth Paragraph: In addition to the area-average fines content shown in Figures G5-52 to G5-54, include a probabilistic comparison of the fines content in individual surficial cores, and model-calculated fines content in individual grid cells. The comparisons can be over the same reaches as used in Figures G5-52 to G5-54. This comparison allows for an assessment of how well the model captures the spatial variations in fines content within individual reaches. Review of the FMRM results in this fashion shows spatial patterns in the model-calculated fines content and deviations from data distributions which may be indicative of sand loadings from point source discharges and fine sediment transport from the main stem into some of the tributaries. Review and elaborate as appropriate.
- b. Figure G5-54: There appears to be a minor bug in the model outputs, affecting the model results for CM 0-0.5 shown in Figure G5-54. Reviewing the 15 cm composition output by the model in file Graphics\_bin.out, for a row of cells across the mouth of Newtown Creek (I=12), the fines content at the end of the simulation is reported as 0 even though this row of cells doesn't see any erosion or deposition and so shouldn't deviate from the initial condition of ~90% fines. The area-average fines content for CM 0-0.5 using the 15 cm composition output results in ~50% fines, as shown in Figure G5-54. However, using the fines content in the top 15 cm of the bed calculated from the model restart file at the end of 2012 results in ~70% fines content for this area, a number more similar to the data. Review and address as appropriate.

#### 27. Section 5.4.2.3 Model Validation: TSS Concentration for 2012 to 2015

- a. Page 97, First Paragraph: The TSS model-data comparisons have been presented in terms of individual spatial profiles. However, this prevents an objective assessment of model performance across the entire dataset. This can be achieved using cross-plots of model-calculated TSS versus measured TSS, and probability plots of model-calculated TSS and measured TSS. Review of the FMRM model performance in this fashion shows a bias towards under-prediction with distance upstream in Newtown Creek. This implies that the model likely does not capture the gross tidal transports into and out of the tributaries and in the main stem upstream of CM ~2. In addition, review of the Phase 1 and Phase 2 TSS data show specific trends such as higher concentrations during the flood phase than during ebb phase of the tide, and higher concentration during spring tides than during neap tides. Both trends are physically reasonable and explainable, and are true for most locations within the study area. However, these trends are not reproduced by the model. Model performance for TSS should be considered as a calibration metric rather than as part of validation. This is also relevant for the contaminant fate and transport and food chain models, since TSS concentrations could control contaminant particulate-phase concentrations, and resulting food chain exposure concentrations. Include model-data comparisons for TSS (from water samples as well as estimates from turbidity measurements) as a calibration metric.

- b. Page 97, Last Paragraph, First Bullet: Examine the East River TSS data for seasonal trends and incorporate in the model as appropriate. As mentioned in the comments to Section 5.3.3.1, there may be a seasonal trend apparent in the data. In addition, review the East River TSS data for vertical gradients and incorporate in the model as appropriate. As mentioned in the comments to Section 5.3.3.1, the vertical gradient in TSS in combination with estuarine circulation is a process that can potentially result in net upstream transport of fine sediments.
- c. Page 98, Paragraph Continued from Page 97, Last Bullet: The impact of neglecting primary production of solids can be assessed by reviewing the model-data comparisons on a seasonal basis, separately for May-September and October-April. The former corresponds to the period expected to be affected by primary production and vice versa for the latter. Perform model-data comparisons on a seasonal basis to evaluate the potential for primary production to bias the model-data comparisons. If the wintertime model-data comparisons are similar to summertime model-data comparisons, then there is no likelihood of primary production introducing a bias in model-data comparisons. If this is true, delete this bullet.

28. Section 5.5.1.1 Diagnostic Analysis: Continuous versus Superposed Simulations

- a. Page 98, Third Paragraph: As mentioned in the comments to Section 5.4.2.1, the purpose of this analysis is not apparent. Will parallel simulations be performed in the future or is the continuous simulation approach the preferred approach for the FS simulations? Revise the text to address the purpose of this analysis or, if the latter, delete this paragraph and associated figure.

29. Section 5.5.1.2 Diagnostic Analysis: Relative Effects of East River and Point Source Sediment Loads

- a. Page 99, Paragraph Continued from Page 98 and Figure G5-60: Figure G5-60 is a nice presentation of model performance. Add a similar figure in Section 5.4.2.1 along with another line to indicate the measured laterally averaged NSR. This will allow another type of assessment of model performance relative to data.
- b. Page 99, First Complete Paragraph: Add text with rationale for why 2009 was selected for this diagnostic simulation and if 2009 is a typical year with respect to point source loadings.

30. Section 5.5.1.3 Diagnostic Analysis: Sediment Mass Balances, Page 101, 3rd bullet. Revise the report to describe the impact of the assumed constant SSC boundary conditions at the East River boundaries on the 4,900 MT/year net incoming sediment load.

31. Section 5.5.3 Diagnostic Analysis of Direct Geomorphic Feedback, Pg 104. Revise the report to explain how “direct feedback between the hydrodynamic and sediment transport models” was accomplished.

32. Section 5.5.4 Diagnostic Analysis: Sediment Mass Balances

- a. Page 100, Equation G-18: This equation neglects any import from point sources elsewhere in the domain and from the East River loadings. In other words, trapping efficiency for a given tributary is calculated relative only to the point sources loading in that tributary. It

ignores other sources of sediment loading to the tributary such as sediment discharged from point sources elsewhere in the domain and sediment from the East River loadings. Either (1) list this assumption, or (2) revise Equation G-18 appropriately, considering all sources of sediment loadings.

- b. Page 101, Bullet List carried over from Page 100 and Figure G5-65: There seems to be an inconsistency between the information in the bullet list, and the model results shown in Figure G5-63. The trapping efficiency for English Kills is listed as 100% in Figure G5-65 – 230 MT/yr of sediment is discharged from the point sources in English Kills, and 230 MT/yr of deposition is shown in English Kills, which implies that all the sediment discharged from the point sources in English Kills is trapped within this tributary. However, Figure G5-63 shows that ~5% of the sediment deposited within English Kills originates from the East River. In other words, ~12 MT/yr of the 230 MT/yr represents East River solids. This is inconsistent with the 0 MT/yr exchange between English Kills and Main Stem indicated in Figure G5-65. In addition, trapping efficiency, as written in Equation G-18, can only be a maximum of ~95%. Furthermore, of the ~218 MT/yr of point source loadings depositing in English Kills, it is not clear if any of this sediment originates from point source releases from elsewhere in the Study Area, e.g. East Branch, Turning Basin, etc. Accounting for all the sediment loadings to a given reach (point sources within reach, and advection from downstream) in Equation G5-18 will address this issue. Review this issue and address in the text and figures as appropriate for the other reaches and tributaries listed in the text in this section and in Figures G5-65 to G5-71.

### 33. Section 5.5.4 Diagnostic Analysis of Organic Carbon Solids Transport

- a. Page 106, Second Paragraph: The following statement is made regarding the type of organic carbon (OC): *“The data-based results discussed above show that TOC content in bed sediment in the tributaries (approximately 10 to 20%) and  $f_{OC}$  in CSO and stormwater discharges (average of 16%) are similar. This consistency between  $f_{OC}$  in point source discharges and TOC content in bed sediment indicates that OC solids in point source discharges are primarily composed of G3 OC, with relatively minor amounts of G1 and G2 OC. Thus, OC solids in the sediment transport model diagnostic simulation were represented by assuming that 100% of the OC solids were the very slowly decaying (G3) OC fraction.”*

The above rationale for making this conclusion cannot be justified. Just because the  $f_{OC}$  values for CSO, stormwater, and point source discharges are similar to  $f_{OC}$  of tributary bed sediment does not justify assuming that all OC loadings are G3. Non-point and point source loadings are most likely composed of both labile and refractory OC. The G fractions are typically used to distinguish the benthic sediment OC types, not the OC of the water column and loadings. The usual practice is to assign labile OC deposited to benthic sediment to the G1 class and to split the refractory OC deposited to benthic sediment between the G2 and G3 classes. It is highly doubtful that the OC loadings from non-point and point source loadings are all highly refractory and associated with the G3 class following deposition. CSO and wastewater treatment plant loads are likely to have considerable labile OC which would fit into the G1 class when deposited to benthic sediments. Therefore, it is unreasonable to assume that all point source OC loadings are highly refractory (i.e. G3). Point source OC loadings comprise a mix of labile and refractory forms of OC. Following deposition to the

bed, the G1 (labile) and G2 forms of OC will degrade and cannot be assumed to be conservative. In addition, primary production in the water column may also provide an additional source of OC which may subsequently be deposited to the bed. Revise this diagnostic analysis by considering the various forms of OC appropriately – primary production, labile and refractory in the water column, and G1/G2/G3 in the sediment bed.

- b. Page 106, Third Paragraph: The model OC is distributed among four size classes that correspond to sediment size classes in terms of settling rates (see Table G5-13). There is no explanation of how the OC is split among these four size classes. Add a discussion and justification to explain how the OC is fractioned.
- c. Page 106, Third Paragraph: The length of the diagnostic simulation was one year, which is not long enough to properly evaluate the adequacy of the organic solids transport model. The net sediment rate is on the order of ~1-2 cm/yr, so for a one year simulation, the depositional contribution to the sediment bed is small relative to the mass within the model bed layer. Thus, with such a short simulation period, the model results at the end of one year will be very similar to the initial conditions. It then becomes relatively easy to force model agreement with observations by adjusting the initial conditions. Revise this diagnostic analysis with a much longer simulation period (over the 1999-2012 period used for the sediment transport model) for proper diagnostic evaluation.
- c. Page 107, First Complete Paragraph: Results of a one-year diagnostic simulation are compared with observed surface sediment TOC concentrations in Figures G5-90 – G5-93. Recognizing the shortcomings of the short simulation period where one-year results are similar to initial conditions (preceding comment), the model results compare relatively well with observed TOC along Newtown Creek (Figure G5-90). The spatial averages for model results and observed data along Newtown Creek also compare favorably (Figures G5-91 – G5-93). However, there are no spatial comparisons of computed and observed data within East Branch, Maspeth Creek, and Dutch Kills. Present a comparison of model results along each tributary reach with observed data from the tributaries, without spatial averaging, to show how well the model performs and to determine if the model satisfactorily exhibits the rather rapid upstream increase in tributary bed TOC (i.e., 10 to 20 % TOC).
- d. There are no comparisons of model results with observed suspended OC data (particulate organic carbon, POC) for the water column. Such comparisons are necessary to obtain a complete picture of model performance. Revise the document to include such comparisons.

#### 34. Section 5.5.5 Diagnostic Analysis of Hard Bottom Assumption in East River

- a. Page 108, First paragraph. The report states that the only source of sediment that was transported into and out of the active surface layer was suspended sediment in the East River. Revise the report to identify other sediment sources within the system.
- b. Page 108, Second Paragraph: The diagnostic simulation shows higher net solids flux from the East River into Newtown Creek. However, the text does not explain this result and the transport mechanisms responsible for this result. Elaborate upon this result in the text.

- c. Page 108, Second Paragraph: Elimination of the hard-bottom assumption in the East River likely leads to erosion and deposition over tidal time-scales within the East River. Since this is a realistic phenomenon for such tidal systems, there is a physical basis and argument for not including a hard-bottom assumption in the East River. Eliminate the hard-bottom assumptions in the East River.

### 35. Section 5.5.6 Diagnostic Analysis of Propwash Resuspension

- a. Page 109, First Paragraph: Elaborate on why propwash-induced scour is important in Newtown Creek. Besides the existence of localized scour holes as evident in the multi-beam bathymetry data, what other evidence exists that provides an idea of the relative importance of propwash-induced scour relative to normal hydrodynamic forcings (tides, point source discharges, estuarine circulation, etc.)? In other words, how important is propwash-induced scour to the large-scale spatial and temporal patterns of suspended sediment transport? Revise the text accordingly.
- b. Page 109, Last Paragraph, Fourth Bullet: Elaborate on why the direction of transit (inbound or outbound) matters for propwash and scour.

### 36. Section 5.5.6.1.2 AIS Data Analysis: Historical Data

- a. Page 112, Second Paragraph: Define what is indicated by the term “Ship days” which first appears in Figure G5-103. Also, elaborate on how the information in Figure G5-103 does not represent a complete picture of navigation traffic because of the discrete nature of AIS data.

### 37. Section 5.5.6.3.2 Development and Calibration of Empirical Propwash Model

- a. Page 118, Second Paragraph: Revise the text to indicate that the AIS data does not provide information on the actual draft which depends on whether the vessels are loaded or not. Rather, AIS data only provides the rated draft which (in combination with the local instantaneous water depth) does not provide a true measure of the distance between the propeller shaft and the sediment bed.
- b. Page 118, Third Paragraph Bullet List: Add uncertainty on the actual vessel draft to this list.

### 38. Section 5.5.6.4.1 1-Year Diagnostic Simulation: Single Representative Ship

- a. Page 120, Last Paragraph Bullet List: The two potential calibration terms listed here represent a control on the erosion (first bullet, Probability of resuspension), and a control on deposition (second bullet, Effective settling speed of resuspended Class 1 sediment). Calibrating both the erosion and deposition process in this context can lead to non-unique solutions. For instance, a given TSS response in the water column can be achieved as the net of two large parameter values for the two terms, or as the net of one moderately-high term (for example, the erosion-related term) and a deposition term with relatively average value. Develop an approach that minimizes the need for calibration. Also, see the next comment.
- b. Page 120, Last Paragraph First Bullet: It is not clear why the erosion due to propwash needs to be subject to calibration. The Sedflume data summarized in Section 5.3.2 in

combination with the site-specific data on particle diameters, and grain size distribution should in principle be adequate to characterize the erosion properties of the bed due to typical hydrodynamic forcings (tides, point source discharges, etc.), and propeller wash. Given the existing erosion parameterization and the context of the preceding comment, do not use the probability of resuspension due to propwash as a calibration parameter. Revise accordingly.

- c. Page 120, Last Paragraph Second Bullet: Provide sufficient justification and evidence why the settling speed of Class 1 sediment resuspended due to propwash scour should be different from the settling velocities used for Class 1a and Class 1b in the base calibration simulations.

#### 39. Section 5.5.6.4.2 1-Year Diagnostic Simulation: Multiple Ships

- a. Page 123, First Paragraph: Why does the ship traffic for 2009 (Figure G5-141) look dramatically different from 2010 (Figure G5-132) upstream of CM 1? For instance, Lower English Kills sees 300-400 Ship-days of vessel traffic in 2010 but only 1-50 Ship-days in 2009? Traffic seems to have increased by a factor of ~10 in a 1-year period. Revise the text accordingly.
- b. Page 124, First Paragraph First Bullet: How were the simulations with propwash scour judged to “yield realistic predictions”? Describe in detail the process whereby model performance with propwash scour is assessed and judged, describe the model calibration process, and present a comparison of model and data.
- c. Page 124, First Paragraph First Bullet: Realistic predictions of propwash scour are mentioned as being generated by “adjusting input parameters within the range of values used in the diagnostic analysis”. Describe what a realistic range of parameter values should be for the two calibration terms related to propwash scour predictions. For instance, the 200 m/d settling velocity used in one of the diagnostic simulations corresponds to nearly fine sand, whereas the surficial sediments in the majority of the Study Area are known to be comprised of fine sediments.
- d. Page 124, 2nd bullet. The report states that “Predicted NSRs are ... relatively insensitive to variations in effective particle diameter, when the settling speed was at the upper-bound value (200 meters/day)”. The significance of this statement is unclear. Revise the report to describe why there are differences in the predicted NSRs with particle diameter if the settling speed was held constant.

#### 40. Section 5.5.6.4.3 Path Forward

- a. Page 124, Second Paragraph: The propwash resuspension model is described as producing “*realistic results that are qualitatively representative*”. However, the preceding text does not discuss any of the four diagnostic simulations with varying parameter values for the two calibration parameters in the propwash scour model. It is not clear what the proposed parameter value is for either of these terms. Nor is it clear what rationale was used to judge the model performance as realistic and qualitatively representative. Add sufficient discussion of the model results and arguments leading to these conclusions.

#### 41. Section 5.6 Conclusions

- a. Page 124, First Paragraph: The first sentence and the bullet list is somewhat confusing. Is the intent to list model inputs for which adequate data was available and used to specify inputs, or is it meant to be a general listing of inputs and parameters that affect model performance as indicated in the first sentence? If the former, reword the introduction. If the latter, add additional inputs and parameters such as the settling velocity of the two flocculated clay/silt classes, and grain size distribution of East River loadings which also affect the performance of the sediment transport model.
- b. Page 125, Bullet List in Paragraph Continued from Page 124: List all the individual model inputs and parameters subject to calibration. Specifically, the settling velocity of two Class 1 classes were developed by calibration, and the composition of three sediment classes from the East River was developed by calibration, making for a total of 5 parameters and inputs that were developed by calibration.

#### 42. Section 7.3 Conceptual Site Models for Hydrodynamics and Sediment Transport

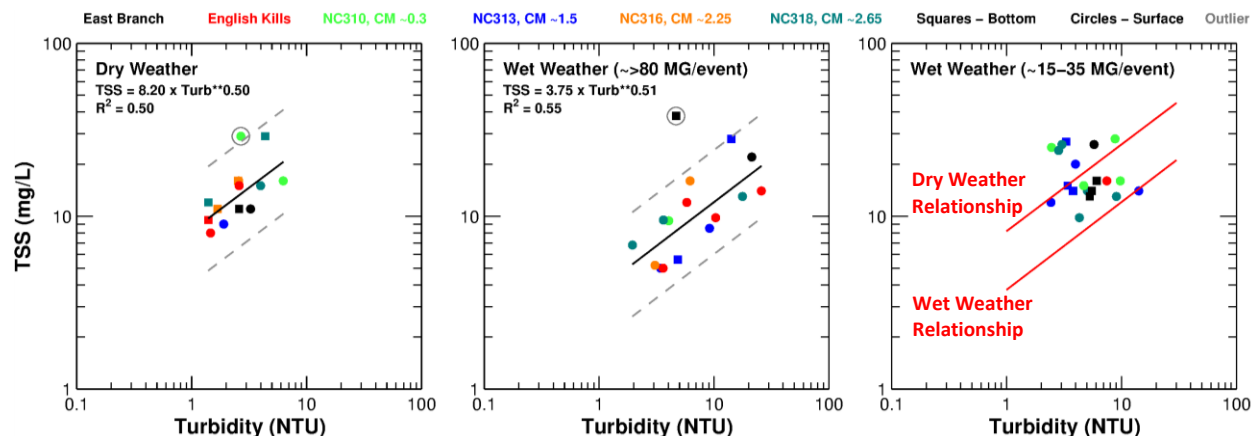
- a. Section 7.3.1, Page 134: The data and model results presented in section 4 are not referenced in the CSM for hydrodynamics described in Section 7. It is not clear what elements of the CSM were developed based on empirical data and what elements were developed using the numerical model. The CSM presented is fairly generic in that it can apply to any small tidal channel. Add text describing the behavior of the system during point source discharge events to describe how these events modify the currents and salinity in the system, and how this could drive the transport of sediment.
- b. Section 7.3.2, Page 135: It is not clear what elements of the CSM were developed based on empirical data and what elements were developed using the numerical model. Consider implementing more empirical lines of evidence in developing the CSM, especially the statements about the relative contributions of East River and point source loadings to sedimentation within various reaches, importance of propwash relative to normal hydrodynamics, potential difference in sediment dynamics during point source discharge events and during dry-weather conditions, etc. Currently, these seem to be based only on model results, but it would be a stronger statement if such findings can be based on empirical measurements. Revise the text accordingly.
- c. Section 7.3.2, Page 135, Third Paragraph: This is the very first mention anywhere in the text on the atypical vertical gradients in TSS during wet-weather versus dry-weather periods. Elaborate on such patterns in Section 5, and add a new sub-section dealing with suspended sediment transport patterns determined from various data-based lines-of-evidence.
- d. Section 7.3.2, Page 136, First Paragraph: See comments to Attachment G-I on the issue of temporal changes in CSO and point source loadings.

## **Attachment G-F Specific Comments**

### **1. Attachment G-F, Section 1.1 Correlation Analysis of Turbidity and TSS Concentration Data**

- a. Page 1, Second Paragraph: Qualify the statement “*Paired samples of turbidity and TSS concentration data were collected during Phase 2 at bulkhead sondes...*”. Review of the water depths recorded by the surface and bottom YSI meters show occasional differences in excess of 6’ between the depths in the water column where turbidity was measured and where a corresponding water sample was collected for TSS measurements. This is a relatively large difference (relative to the total water column depth), and it also implies that the turbidity and TSS measurements are not truly paired. In other words, measurements can be termed as paired only if made at same point in time and space.
- b. Page 1, Third Paragraph: EPA has reviewed the data used to develop the bulkhead sonde turbidity-TSS correlations shown in Figures G-F-1, G-F-3, G-F-5, G-F-7, G-F-9, and G-F-11. The analysis focused on identifying the sources of variability in the turbidity-TSS relationships. The two major sources of variability include fouling of the turbidity sensors, and differences in the depth sampled by the turbidity sensor and the TSS water sample collection depth. In addition, a smaller subset of water samples also likely include location artifacts, where the water samples were collected in locations with total water depths somewhat different than at the sonde locations.

Excluding the data affected by the afore-mentioned sources of variability, the turbidity-TSS relationships primarily appear to be a function of the environmental conditions, as seen in Figure 4. The dry-weather relationship includes data from the August 2014 and October 2014 sampling events, and the large (>~80 MG/event) wet weather relationship includes data from the December 2014 and August 2015 sampling events. Data from the remaining events (March 2015, April 2015, and September 2015) consist of relatively smaller wet weather events (~15-35 MG/event). The total point source discharges during these events were estimated using the point source flow input files provided with the FMRM model. The coefficient of determination ( $R^2$ ) for the dry-weather and large wet-weather relationships are 0.50 and 0.55, respectively. This may partly be due to the fact that variability due to differences in the TSS sampling depth and sensor depths was only reduced (by excluding TSS samples collected at depths more than 3’ apart, in the vertical, from the turbidity sensor) but not eliminated entirely. Nonetheless, the individual TSS values are within a +/- 2X envelope around the turbidity-TSS regressions, which is typical for such relationships.



**Figure 4. Turbidity-TSS relationships for the bulkhead sondes in Phase 2. Black lines in left and middle panels indicate the turbidity-TSS regression, dashed lines indicate +/- factor of two around the regression. Red lines on right panel indicates the dry-weather and large wet-weather relationships shown in the left and middle panels.**

Comparison of the dry-weather and wet-weather relationships shows an apparent increase in turbidity in the entire study area during large wet-weather events. This appears consistent with various aerial images of the study area, which show somewhat more turbid water originating from the tributaries, especially during wet-weather events. An increase in turbidity would also be conceptually consistent with (1) point source discharge events during such conditions, with a higher dissolved organic matter loadings expected from CSO releases than water originating from the East River, and (2) with additional solids loadings from point source releases. Due to the relatively large variability in the turbidity-TSS pairs, a turbidity-TSS relationship was not derived for the smaller wet-weather events (~15-35 MG/event). Nonetheless, it is worth noting that the majority of the turbidity-TSS pairs fall in between the dry-weather and large wet-weather relationships. This is conceptually consistent with the hypothesis of relatively more turbid water associated with point source discharges; releases during the smaller point source discharge events would be subject to relatively more dilution with East River water than during larger events and thus show lesser impacts on turbidity than during large wet weather events.

The dry-weather and large wet-weather turbidity-TSS relationships provide a basis to estimate TSS time-series using turbidity measurements during such conditions. The resulting TSS time-series can provide a basis for understanding sediment transport processes in the system and provide calibration metrics for the sediment transport model under these conditions which also bracket the range of environmental conditions expected in the study area. Include TSS time-series estimated from turbidity data in understanding sediment transport in the system during dry-weather and large wet-weather conditions, and use these TSS estimates in as a model calibration metric.

- c. Page 1, Third Paragraph: Refine the regression analyses of the hand-held sondes and measured TSS after reviewing the turbidity-TSS pairs for the various sources of variability noted in EPA's analysis of turbidity-TSS described in the preceding comment:
  - i. Turbidity sensor fouling

- ii. Consistent sampling depths for turbidity and TSS water samples
- iii. Location artifacts, where the water samples may have been taken in a portion of the channel cross-section with significantly different total water depth than the location of the turbidity measurement

## 2. Section 1.2 Evaluation of NYCDEP and Phase 2 TSS Concentration Data

- a. Page 2, First Complete Paragraph: The comparisons in Figures G-F-14 and G-F-15 make the distinction between near-surface, mid-depth, and near-bottom samples collected during Phase 2. However, no such distinction is made for the NYCDEP stations. Could the NYCDEP data include only near-surface samples or depth-integrated samples? If so, that could explain the difference between the two datasets. Review the data and address in the text and subsequent analyses as appropriate.

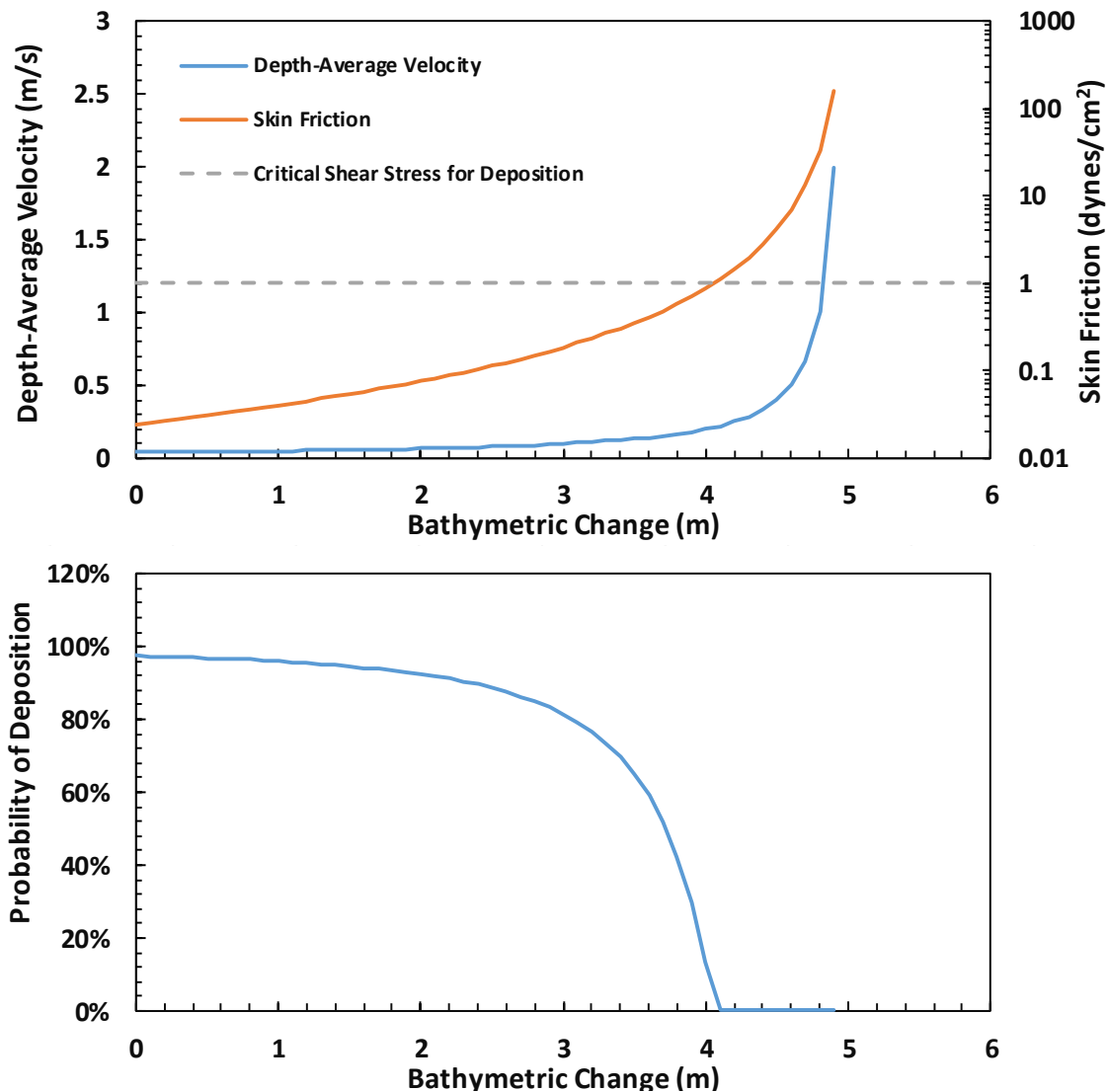
## 3. Section 1.3 ADV and Near-Bottom Turbidimeter Data Collection and Analysis

- a. Page 5, Third Paragraph: Given the apparent increase in turbidity in the system described previously in the discussion of the turbidity-TSS relationships, filtering the turbidity data to exclude periods with large wet-weather discharge events may potentially improve the turbidity-ABS correlations shown in Figures G-F-43 through G-F-48. Filter the turbidity and ABS pairs shown in Figures G-F-43 through G-F-48 by excluding periods of large wet-weather events and reassess the turbidity-ABS correlations, use to estimate TSS time-series, and use for calibrating the propwash scour model as originally described in Section 7.2.3.5 of the Phase 2 RI Work Plan (Anchor QEA, 2014).
- b. Page 5, Third Paragraph: The turbidity-ABS correlation for NC311 shown in Figure G-F-43 has a coefficient of determination ( $R^2$ ) of 0.66 (this could potentially improve following the suggestion in the preceding comment). This is a potentially useful relationship, at a location experiencing the most navigation impacts of all the ADV deployment stations. Uncertainty in the turbidity-TSS relationship can be incorporated into the TSS estimates resulting from the high-frequency (1 second interval) estimates of turbidity. Review the correlation following the suggestion in the preceding comment, and use for calibrating the propwash scour model as originally described in Section 7.2.3.5 of the Phase 2 RI Work Plan (Anchor QEA, 2014).
- c. Page 5, Third Paragraph: Since the 15-minute turbidity data do not always show the same propwash impacts as the 1-second ADV/ABS data, focusing only on the events where both sets of measurements indicate resuspension may be a defensible approach for evaluating propwash impacts on suspended sediment concentrations. The estimated 1-second interval turbidity can be used to estimate TSS time-series using the dry-weather turbidity-TSS relationship as originally intended in the Section 7.2.3.4 of Volume 2 of the Phase 2 RI Work Plan. The resulting TSS time-series will provide data to calibrate/validate the propwash model described in Section 5.5.6 of Appendix G. Review and develop a strategy to reconcile the 15-minute and 1-second ABS data, and use to estimate TSS time-series for use in calibrating the propwash scour model.

## **Attachment G-G General Comments**

The evaluation of NSRs based on Cs-137 and Pb-210 activity in Section 1.3 proposes historical changes in the sediment loadings from point sources as an explanation for the higher NSRs based on Cs-137 than Pb-210. However, no other lines of evidence (e.g., historical measurements or estimates of point source flows & suspended sediment concentrations, changes in the watershed, point source controls, etc.) are provided in support of the argument of a temporal change in point source sediment loads.

From a conceptual standpoint, there are two constraints on the process of sedimentation – sediment supply and trapping efficiency, with the resulting sedimentation rate a positive function of both constraints. The arguments in Section 1.3 focus only on a hypothesized change in historical point source sediment loadings as an explanation for the temporal decline in sedimentation rate noted in some of the geochronology cores. This process is fairly straightforward – for a given trapping efficiency, sedimentation rate over a given area will be direct function of the sediment loading rate. The limitation of trapping efficiency on sedimentation rate over time can be conceptualized using the approximate geomorphic feedback method used in the FMRM model (described in Section 5.3.4 of Appendix G). For a given flow rate passing a given location in the system, as water depth decreases with sedimentation, velocity increases due to the reduction in cross-sectional area, thus increasing bed shear stress. The increase in bed shear stress causes a decrease in the probability of deposition (calculated using Eq. G-J-7), a parameter linearly related to the sedimentation rate. Therefore, as water depth decreases with increasing sedimentation at a given location, the probability of deposition decreases, thus reducing trapping efficiency, and therefore sedimentation rate. This process is shown graphically, for an arbitrary cross-section with a constant flow rate of  $2 \text{ m}^3/\text{s}$ , constant cross-section width of 10 m, initial depth of 5 m, D90 of 1400  $\mu\text{m}$ , and critical shear stress for deposition of  $1 \text{ dyne}/\text{cm}^2$ . With increasing sedimentation (manifest as bathymetric change), flow velocity increases as shown in the upper panel due to a decrease in water depth. This causes an increase in the skin friction at the bed-water interface (also shown in the upper panel). Using the Krone formulation for probability of deposition (one of the commonly used formulations), as shown in the lower panel, the probability of deposition decreases with increasing skin friction (i.e., increasing sedimentation or decreasing water depth). At a bathymetric change of  $\sim 4.1 \text{ m}$  (corresponding to water depth of 0.9 m), the skin friction becomes equal to the critical shear stress for deposition at which point the probability of deposition reduces to 0 and sedimentation ceases. In other words, the probability of deposition (which is a surrogate for the trapping efficiency) is in a state of dynamic equilibrium with the ongoing sedimentation. This imposes a natural upper limit on the sedimentation that can be achieved in a tidal system such as Newtown Creek. Therefore, the potential for changes in sedimentation rate due to a temporal change in sediment loadings as well as changes in trapping efficiency are to be considered when evaluating data that exhibit temporal changes in sedimentation rate.



**Figure 5. Conceptual depiction of a decrease in the probability of deposition, a surrogate for the trapping efficiency, as a function of increasing sedimentation or decreasing water depth (lower panel). Upper panel shows the increase in depth-average velocity and skin friction as a function of increasing sedimentation.**

The geochronology core dataset includes eighteen cores where both cesium-based and lead-based NSRs were calculated. Figure 6 shows the cesium-based versus lead-based NSRs for these cores (left panel), and the cesium-based NSRs versus the 2012 bathymetry at the core locations (right panel). Eight cores (seven in the main stem and one in English Kills) have lead-based NSRs that are similar (within a factor of two) to the cesium-based NSRs. This suggests no temporal changes in sedimentation occurred at these locations, and therefore no changes in sediment supply or trapping efficiency. Review of the remaining ten cores (with cesium-based NSRs more than a factor of two higher than lead-based NSR) relative to the 2012 NCG bathymetry at the core locations suggests that sedimentation rate in a majority of these cores may currently be limited by trapping efficiency. For six of these cores (mostly located within the tributaries), the current bathymetry is relatively shallow and within ~2 ft of Mean Low Water (MLW) levels. Using the cesium-based NSR indicates that in the 1960s, these locations would have been 3 ft to 11 ft deeper than currently. Therefore, a

decrease in trapping efficiency may be an equally plausible explanation for the decreasing temporal trend of NSRs in these cores as changes in sediment loadings from the point sources.

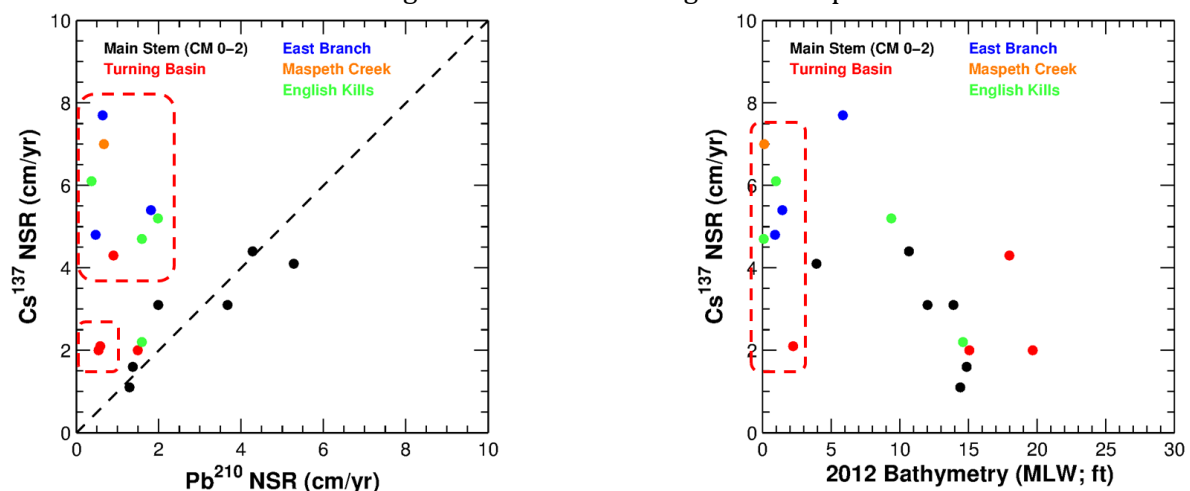


Figure 6. Geochronology NSRs relative to 2012 bathymetry at geochronology core locations.



Figure 7. Morphological evolution of Maspeth Creek as seen in NOAA navigation charts. Depths in ft relative to MLW.

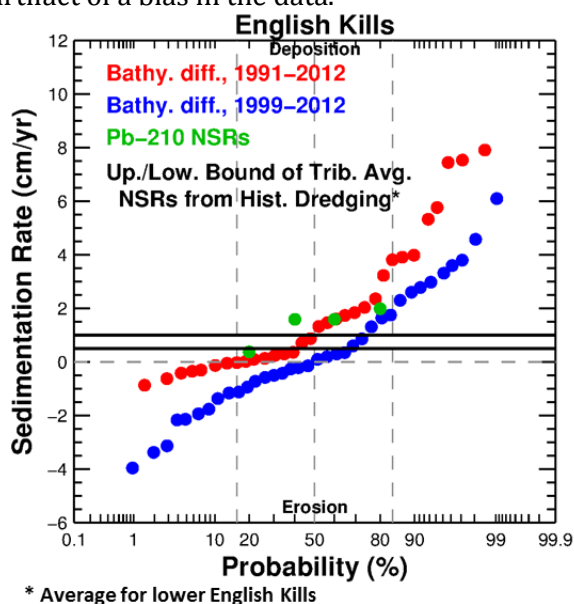
The remaining 4 cores (with cesium-based NSRs more than a factor of two higher than lead-based NSR), do not appear to be limited by trapping efficiency based on water depth. However, there may be additional historical changes that may have caused a change in shear stress regime and therefore the trapping efficiency and resulting sedimentation rate. For instance, review of NOAA's navigation charts (shown in Figure 7) along with the dredging history (Section 1.4 in Attachment G-H) of Maspeth Creek shows that even though a navigation channel was dredged in this tributary in the

1930s (to 20 ft below MLW), as seen in the upper left panel in Figure 7, it had infilled significantly by the 1950s. Between 1952 and 1974, the sedimentation rate is on the order of  $\sim 10$  cm/year. This rapid sedimentation may reflect a change in the shear stress regime due to a decrease in navigation activities (propeller wash can cause a local increase in the shear stress regime thus reducing trapping efficiency) in this tributary sometime between the 1930s and 1952. Since 1974, due to the relatively shallow depths in much of the tributary, sedimentation rate inferred from these navigation charts is on the order of  $\sim 1$  cm/yr, likely limited by trapping efficiency, due to the relatively shallow water depths. It is also worth noting that the sedimentation rates inferred from these navigation charts is within the range of NSRs calculated from geochronology (both Cs-137 and Pb-210) in this tributary, with the cesium-based NSR approximately ten times higher than the lead-based NSR.

These observations suggest that the difference between the cesium-based and lead-based NSRs cannot be taken solely as an indication of temporal changes in point source sediment loads. There are additional considerations (change in trapping efficiency due to changing water depth as well as navigation impacts) that explain the temporal trends noted in the geochronology NSRs. Revise the text and analysis to include a balanced analysis including alternative possibilities such as temporal changes in trapping efficiency and navigation history that could also partly or wholly explain the observed temporal changes in sedimentation rate.

#### **Attachment G-H General Comments**

1. Several analyses related to NSRs using bathymetric data are presented in this attachment. However, in some cases, the findings are not explored in detail. For instance, although the 1991-2012 bathymetric comparison shows mostly sedimentation in the tributaries, the 1999-2012 bathymetric comparison shows erosion over approximately half the area in English Kills and in part of the East Branch (Area 5 in Figure G-H-12). However, these patterns of erosion have not been evaluated from a data quality perspective, i.e. is the pattern of erosion real and explainable given the known forcings in the system (e.g., hydrodynamics, navigation impacts, etc.), or is the pattern of erosion an artifact of a bias in the data.



**Figure 8 Probabilistic comparison of net sedimentation rate from various lines of evidence.**

Figure 8 shows a probabilistic comparison of NSRs in English Kills and represents the results of an analysis to reconcile NSRs from various lines of evidence, assess data quality, and evaluate the erosional signal noted in English Kills during 1999-2012. The NSRs from bathymetric comparison were developed by calculating the difference between the 1991/1999 single-beam bathymetry and the 2012 multi-beam bathymetry at the corresponding locations, with each of the red and blue symbols in Figure 8 representing the average NSR calculated for given single-beam transect. NSRs based on the Pb-210 cores collected in the English Kills are included with green symbols. The upper- and lower-bound estimates of NSR based on historical dredging records (shown in Figure G-H-56) is also included with horizontal black lines.

Figure 8 shows that more than ~50% of the transects show erosion during 1999-2012, whereas only approximately 15% of the transects show erosion during 1991-2012. Spatially, the erosional signal during 1999-2012 is distributed within specific areas within English Kills – Figure G-H-10 shows a consistent pattern of erosion in the southern half of the cross-section in lower English Kills (Areas 3 and 4 shown in Figure G-H-6). In some locations, erosion of up to 6' is calculated over the 1999-2012 period. Comparing the 1991-1999 surveys implies significant sedimentation in these same areas, up to 9' in some cases. The spatially continuous pattern of erosion suggests a distinct signal that is either real or the result of some artifact in the data. However, even if said accumulation from 1991-1999 was explainable (for argument's sake), the erosion signal cannot be explained given the known hydrodynamic and anthropogenic forcings (primarily navigation which is relatively negligible in this tributary at approximately 1 vessel/month). Nor can the erosion signal be attributed to analytical/sampling variability in the 1999 single-beam bathymetry data – such variability would be expected to manifest itself as randomly distributed in space rather than being spatially coherent. Furthermore, all 4 cores with Pb-210 based NSRs were collected in areas where erosion is noted in the 1999-2012 bathymetric comparison. The signal of erosion in the 1999-2012 bathymetric comparison and sedimentation in the Pb-210 dating (which reflects the sedimentation rate over the preceding 10- to 20-year time-horizon, approximately the same time-frame as the 1999-2012 bathymetric comparison) is mutually inconsistent. Furthermore, reviewing the NSRs based on 1991-2012 bathymetric differencing relative to the range of Pb-210 NSRs shows ~50% overlap between the two. In contrast, the Pb-210 NSRs overlap with only roughly 15% of the 1999-2012 bathymetric differencing distribution. In addition, the tributary-average NSR based on historical dredging records is very close to the median NSR based on 1991-2012 bathymetric differencing. These comparisons of NSRs based on 1991-2012 bathymetric differencing, Pb-210, and historical dredging suggests consistency between these various lines of evidence in English Kills and provides confidence in these NSRs. In contrast, the 1999-2012 bathymetric differencing appears to be an outlier, showing erosion that cannot be explained given known forcings, and is inconsistent with the Pb-210 and historical dredging NSRs. Therefore, the 1999-2012 bathymetric comparison may likely be unreliable, possibly due to artifacts in the 1999 bathymetric survey.

Similar analysis comparing the 1991-2012 bathymetric differencing, 1999-2012 bathymetric differencing, Pb-210 NSRs, and NSRs based on historical dredging records for the other tributaries (East Branch, Maspeth Creek, and Dutch Kills) show, for the most part, consistency between the various lines of evidence. Exceptions include:

- a. The 1999-2012 bathymetric differencing in East Branch which seems to be affected by the same artifact as the English Kills, although to a smaller degree
- b. Uncertainty originating from Pb-210 NSR in one of the cores in Dutch Kills
- c. A localized difference in sedimentation rate near the mouth of Maspeth Creek, higher in the 1991-1999 time-frame than in the 1999-2012 time-frame.

The review of the NSRs from various lines of evidence suggests a data quality issue in the 1999 bathymetry leading to unexplainable results in the 1999-2012 bathymetric differencing in English Kills and to a minor extent in the East Branch. This suggests that the 1999 bathymetry should not be used to support the modeling efforts in these tributaries. In contrast, within Maspeth Creek, the 1999-2012 bathymetric differencing is consistent with the 1991-2012 differencing over the majority of the areal extent of the tributary, the only exception being an area of high infill located near the mouth of the tributary. For the most part, the NSRs based on 1991-2012 in English Kills and East Branch, 1991-2012 and 1999-2012 in Maspeth Creek, and 1999-2012 in Dutch Kills are consistent with NSRs based on Pb-210 and historical dredging records.

Perform a comparative analysis of NSRs from the various lines of evidence as a data quality check and to reconcile NSRs from various lines of evidence.

#### **Attachment G-H Specific Comments**

1. Section 1 Estimation of Net Sedimentation Rates Based on Differential Bathymetry Analysis:
  - a. Page 1, First and last bullets: Given the availability of 1999 bathymetry in Dutch Kills, either (1) include Dutch Kills in this analysis, or (2) provide justification as to why Dutch Kills is being excluded.
2. Section 1.1 Differential Bathymetry Analysis: 1999 to 2012
  - a. Page 2, Second paragraph: Clarify the description in this paragraph. It suggests that in the near-shore zone, the 2012 multi-beam bathymetry data consists of single-beam data from 2011 and LiDAR data, then discusses uncertainty in the 2012 data in the near-shore zone. While a combined dataset may have been generated and referred to as the 2012 bathymetry, in the interest of clarity, suggest developing some alternative terminology to refer to this combined dataset. The 2012 multi-beam bathymetry should refer to only the multi-beam bathymetry collected in 2012. Any combination of this dataset with data from other years should be termed appropriately in the text.
  - b. Page 3, Third paragraph: Based on the values in Table G-H-1 and areal extents in Figure G-H-6, approximately half the length of English Kills experiences net erosion during 1999-2012. However, neither the text in Appendix G nor the text in Attachment G-H discusses this pattern of erosion. If real, it represents the only truly observed erosion signal in the system, and has important implications for the fate and transport of sediments and contaminants, with the eroded sediment (and contaminants) potentially depositing elsewhere in the system. Furthermore, this erosion occurs over the duration of the sediment transport model

calibration period (1999-2012) and is therefore a feature that should be reproduced by the model. Revise the text to discuss in detail the various features noted in the bathymetric difference data along with likely mechanisms that may explain the noted patterns of erosion and deposition.

3. Section 1.2 Differential Bathymetry Analysis: 1991 to 2012
  - a. Page 4, Second paragraph: In addition to Dutch Kills and portions of Whale Creek, 1991 data is unavailable also in portions of the East Branch. Revise the text accordingly.
  - b. Table G-H-2: The area-average NSR for Maspeth Creek seems wrong. Comparing to Table G-H-3 suggests that value in Table G-H-2 is only for Area 1 in Maspeth Creek rather than the entire tributary. Revise the table as appropriate.
  - c. Page 4, Second paragraph: The second sentence of this paragraph suggests that Table G-H-3 includes a comparison of 1991-2012 and 1999-2012 NSRs by sub-area for the tributaries. However, Table G-H-3 only includes a tabulation of the 1991-2012 NSRs by sub-area for the tributaries. Correct the text to accurately reflect the contents of Table G-H-3 or update the table to be consistent with the text.
  - d. Table G-H-3: NSR for Area 4 over 1991-2012 should not be included to the extremely limited bathymetry coverage in 1991 (see left panel on Figure G-H-45 for 1991 coverage). Exclude Area 4 for 1991-2012 from Table G-H-3.
  - e. Figure G-H-46: With the exception of Area 2, the remaining areas in English Kills exhibit either net erosion (areas 1 and 4) or very limited sedimentation (area 3) over 1999-2012. The temporal changes in behavior inferred during 1991-1999 (net accumulation) and during 1999-2012 (net erosion) in areas 1, 3, and 4 are not discussed in the text. Given the fact that these represent the only observed signal of erosion within the study area, revise the text to discuss them in further detail along with potential mechanisms that may explain the measured erosion signal.
  - f. Figure G-H-47: NSR for Area 4 over 1991-2012 should not be included due to the limited bathymetry coverage in 1991 (see left panel on Figure G-H-45 for 1991 coverage). Exclude Area 4 for 1991-2012 from Figure G-H-47.
4. Section 1.4 Differential Bathymetry Analysis: Historical Dredging Periods to 2012
  - a. Page 6, First paragraph: Provide references for the historical dredging data.
  - b. Figure G-H-50: Describe how the year of last dredging was developed, in particular, the spatial distribution. For instance, within the main stem, a ~0.05-mile section around CM 0.4 is shown as being dredged in the 1930s even as areas immediately upstream and downstream are shown as being dredged in the 1940s. Similar areas are also seen along the southern shoreline in the Turning Basin, the entrance to Maspeth Creek, and just upstream of the Turning Basin. This figure also shows a ~0.05-mile stretch between the Turning Basin and English Kills/East Branch where no dredging is shown to have ever occurred, which seems unusual given that areas upstream and downstream of this stretch were dredged.

- c. Figure G-H-51: A 16' dredge depth shown for a ~0.05-mile stretch between the Turning Basin and English Kills/East Branch is unlikely considering that areas upstream were dredged to 18'. Either revise Figure G-H-51 with an 18' dredge depth for this area or provide evidence for a 16' dredge depth.
  - d. Page 6, Second paragraph, third sentence: The fact that current depth is greater than target dredging depth does not necessarily mean erosion occurred since dredging. It could also mean those areas were naturally deep and were therefore not dredged during the last dredging event. Note this uncertainty in the inferred pattern of erosion/deposition in the text and in the resulting NSRs shown in Figure G-H-56.
5. Section 1.5 Differential Bathymetry Analysis: 1999 to 2011
- a. Figure G-H-67: X-axis labels are missing. Revise the figure.

#### **Attachment G-I General Comments**

- 6. This attachment presents the results of a mass balance analysis focusing on potential temporal changes in sediment loadings from point source discharges. The focus of the analysis is on quantifying the point source sediment loadings over the 1991-1999 and 1999-2012 time-frames. However, the purpose of this analysis does not seem to be directly related to the model as applied in the draft RI. The model is applied over the period 1999-2015, and therefore the issue of temporal changes in point source loadings before and after 1999 is inconsequential to model development and calibration. Furthermore, the application of the model during the feasibility study will be to future conditions, and therefore historical point source loadings are of no interest from that perspective either. Therefore, it is not clear why an analysis to quantify potential temporal changes in point source loadings is necessary in the RI report. Either make the connection to the RI in the text or remove this attachment entirely.

#### **Attachment G-I Specific Comments**

- 1. Section 1 Data-based Sediment Mass Balance Analyses:
  - a. Page 1, First Paragraph: As described in the text, the analyses was performed only for English Kills, East Branch, and Maspeth Creek. However, in the Dutch Kills, despite the availability of bathymetry data from 1999 and 2012, as well as Pb-210 and Cs-137 based NSRs, the text makes no mention of this tributary. Include either (1) a justification of why this analysis was not performed for Dutch Kills, or (2) the results of such an analysis for the Dutch Kills.
  - b. Page 1, Second Paragraph: Add justification for the statement "*Average point source sediment loads during the 14-year calibration period were likely higher than sediment loads during the 2015 point source sampling period, due to decreasing combined sewer overflow sediment loads during the calibration period.*"
  - c. Page 1-2, Paragraph 5 starting on page 1, and First and Second Paragraphs on Page 2: The large difference in NSRs between the 1991-2012 and 1999-2012 bathymetric comparisons may be an artifact of a potential data quality issue affecting the 1999 bathymetry survey,

primarily in the English Kills and to a minor extent in the East Branch as well. See comments to Attachment G-H regarding potential data quality issues affecting the 1999 bathymetry. Review and revise the text as appropriate.

- d. Page 2, Last Paragraph: In order to accept the hypothesis that point source sediment loads in the 1991-1999 time-period were greater than during the 1999-2012 period, provide additional supporting evidence. Such evidence can be in the form of measured flows and/or suspended sediment concentrations from the point sources, implementation of watershed-level best management practices, changes to the operation of the sewer system, wastewater treatment capacities, etc., that may have altered the point source solids load over time. As such, the analysis of the 1991, 1999, and 2012 bathymetric data can only be treated as indirect evidence. Other possibilities may also explain a higher sedimentation rate in the 1991-1999 time-frame as compared to the 1999-2012 time-frame. For instance, it is possible that relatively large navigation impacts within the main stem during the 1991-1999 (for instance more traffic during 1991-1999 than during 1999-2012) time-period may have limited accumulation in the main stem and caused relatively large (compared to conditions after 1999) net up-creek transport of sediments to the tributaries. Direct evidence in support of temporal changes in the point source loadings will support and strengthen what is at this point one hypothesis that could explain the temporal change in sedimentation rate.
- e. Page 3: The statement "*the minimum point source sediment loads in these three tributaries for the 1991 to 1999 period correspond to the data-based mass deposition rates for that period*" is not definitive since it ignores the possibility of sediment originating from downstream locations and transported into the tributaries and depositing. Revise by either (1) listing the assumption of no solids from downstream depositing in the tributaries, or (2) including adequate justification of why no solids from downstream would have deposited in the tributaries.
- f. Figure G-I-13: Include values corresponding to the 1999-2012 and the 1991-2012 periods on both panels.

#### **Attachment G-J Specific Comment**

- 1. The model application for Newtown Creek uses the Partheniades formulation for probability of deposition. Include this formulation a part of the model formulations documented in this Attachment.

#### **Attachment G-L General Comment**

- 1. Although the analysis in Section 1.1 in this attachment are referred to in the text of Appendix G, Section 1.2 in this attachment is not referenced in the text of Appendix G. Either (1) provide such reference in the main body of the text, or (2) delete this Section 1.2 from this Attachment.

#### **Attachment G-M General Comments**

- 1. This attachment is currently included in Appendix G without any reference to the text in Appendix G. Either (1) provide such reference in the main body of the text, or (2) delete this Attachment

2. Section 1.3 Effects of Bed Consolidation on Predicted Net Sedimentation Rates, Pg 3, 2nd paragraph. Revise the report to explain in detail any adjustment that was made to NSRs for deeper sediments.

## **References**

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